Ross

PC

The Independent Guide to IBM Personal Computers

Volume 2 Number 5 $2.95
October 1983

REVIEW: 13 NEW PRINTERS

When It All Goes Wrong

Gremlins, Goblins and Glitches

Hyperion: A Truly Portable Workalike

KnowledgeMan Has Arrived

File Management with Next Step

Two APL Systems Compared

Calculating Financial Ratios

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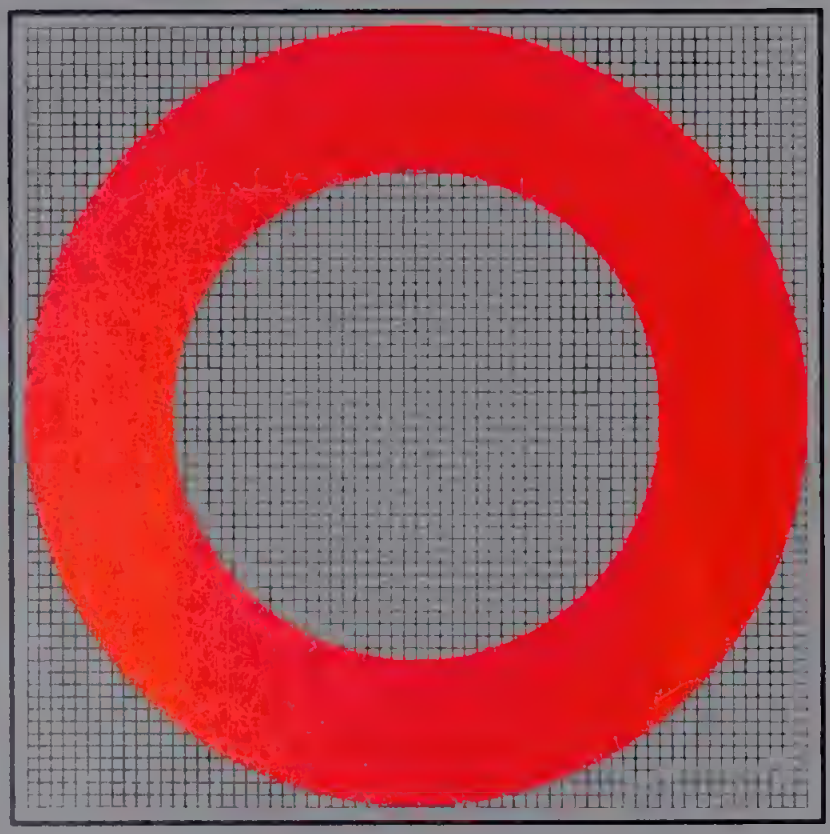

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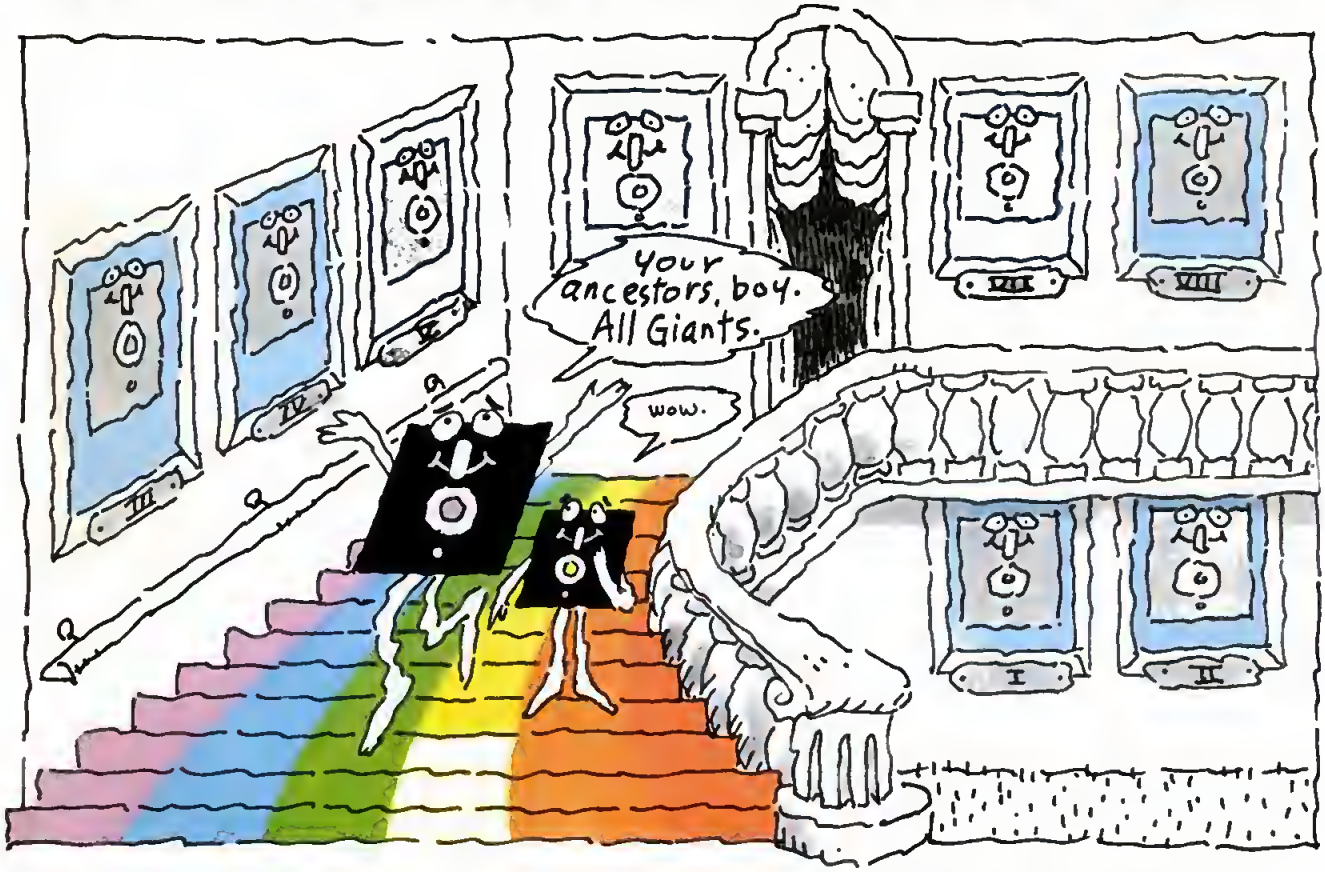

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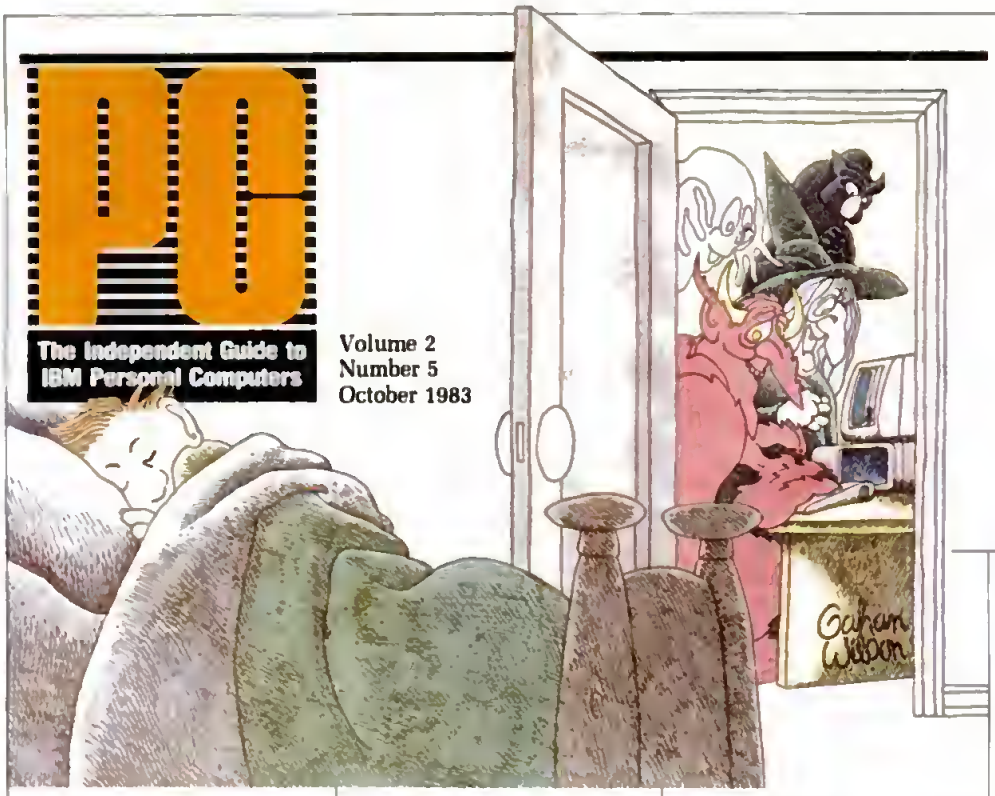

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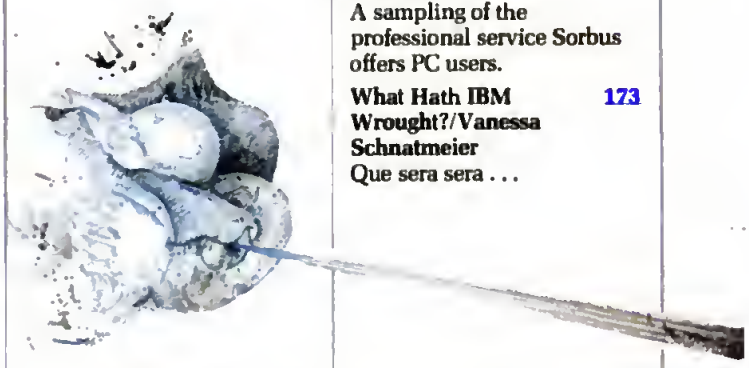

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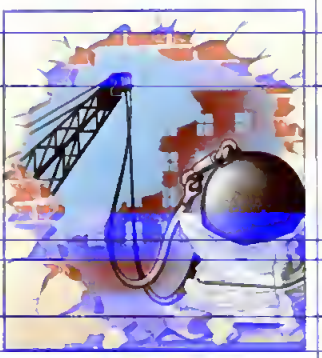

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COVER

Illustration by Gahan Wilson

You're looking at the only word processor that's as easy to use as SuperWriter.™

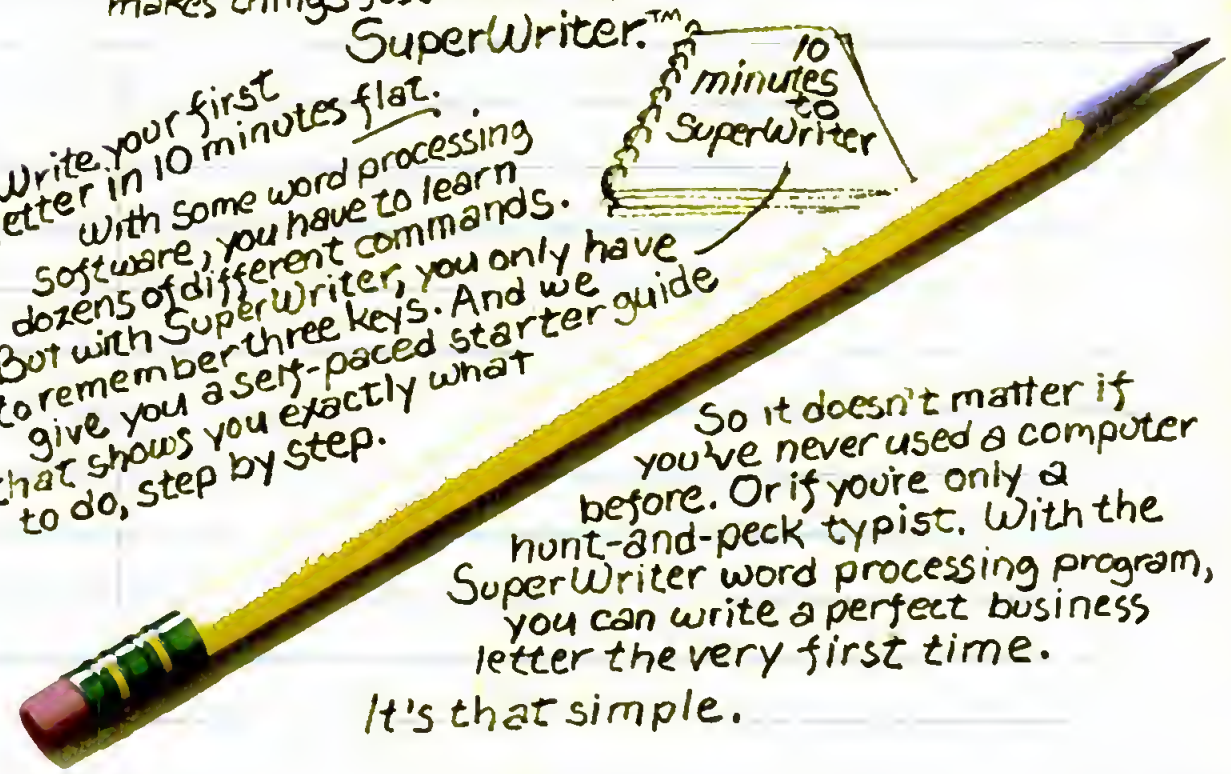
If you're like most people, you don't want to make a career out of word processing. When you have to write a simple letter or memo, all you want to do is roll up your sleeves and get down to business.

And if you're buying a personal computer, now there's a new software package that makes things just that simple.

SuperWriter.™

Write your first letter in 10 minutes flat.

With some word processing software, you have to learn dozens of different commands. But with SuperWriter, you only have to remember three keys. And we give you a self-paced starter guide that shows you exactly what to do, step by step.



So it doesn't matter if you've never used a computer before. Or if you're only a hunt-and-peck typist. With the SuperWriter word processing program, you can write a perfect business letter the very first time.

It's that simple.

Everything you need for only **$295.00** - even a spelling cheker.c

We're talking about a really complete package here. You get a full-function word processor, our 20,000-word SuperSpellGuard™ spelling checker, and a form letter generator. All for $295.00 suggested retail. To get all these functions any other way, you might have to spend $900.00 or more.

You never knew your letters could look so good.

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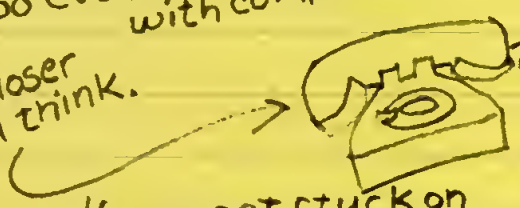
So even if you're a complete beginner, you'll wind up with completely professional results.

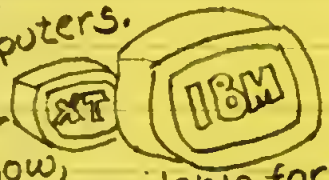
Help is closer than you think.



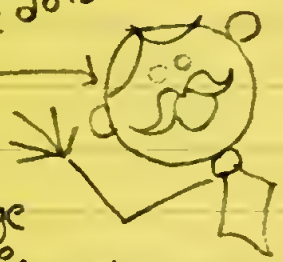
If you get stuck on a problem with any other word processing software, you'll probably have to go back to the store for help.

But if you have any questions at all about SuperWriter, all you do is pick up the phone. We've got a full-time crew of customer service experts on call, ready to help you out.

Works on lots of personal computers.



About the only thing it can't do is doodle.



Right now, SuperWriter is available for the IBM PC and the new IBM PC XT. Of course, it takes full advantage of their features - full color, hard disk and more.

By June 15, we'll have SuperWriter ready for CP/M, CP/M-86 and MS/DOS operating systems, which means you can use it on most of the popular personal computers.

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- **Reliable Back-Up Requirements**
- **Large Data Storage Needs**

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CAMEO'S subsystem 1050, consists of 40 formatted megabytes of on-line winchester data storage and 10 formatted megabytes of removable winchester cartridge back-up capability. In the unlikely event of a problem with the fixed winchester drive the removable cartridge drive can perform as a fully operable full function high performance on line random access winchester hard disk system. It provides highly reliable (full CRC error checking on full spec winchester media) permanent off-line data storage capability for permanent data archiving.

CAMEO'S configuration options allow multiple computers to access all areas of the disk as well as virtual RAM disk configuration from add-on memory boards. Higher capacity systems and nationwide third party maintenance are available. Immediate availability through CAMEO'S regional distributor network.

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A CAMEO interface is available for the above as well as almost any brand of high performance micro computer you are considering for your office use.

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PC Tutor makes learning easier, faster, cheaper.

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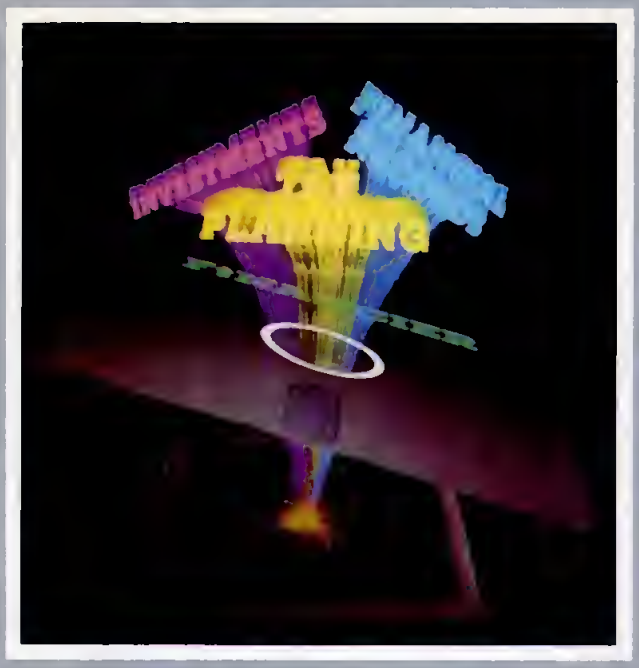

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Now you can have a completely integrated financial software system.

Now Financier II
The financial software that has met with resounding approval from professional software reviewers just got even better. Now, the Financier Personal Series has been upgraded to Financier II. Combined with Financier's Tax Series and Investor's Series, it creates a totally integrated financial management system. Financier II is so easy to use that it is ideal for personal finance yet powerful enough, and flexible enough, to function as a small business system.

"It is clear that the Financier Personal Series is the most sophisticated and flexible of the financial programs under review here."

Burton Alperson, Ph.D.
Reviewer, SOFTALK
June, 1983

Financier II features enhanced graphics capabilities, and expansion of Financier's unique auto-checking capability which prints checks directly from a user-maintained database, while updating bank, budget and tax records. Additionally, it provides a full range of professional-caliber financial statements including net worth, and cash flow reports. You can even opt for double-entry accounting methods, if desired.

Steven Yoder and
Sherry Knight, CPA
PC Magazine, February, 1983

Financier II is remarkably easy to use.
You don't have to be a computer whiz-kid to use Financier II. That's because it's menu-driven. When you need to enter data, just fill in the blanks on the preformatted screen. If you can use an automatic teller machine, you're well on your way to mastering this unique financial software.

Another thing that puts Financier II so far in front of any other financial software package is that it offers powerful tax and inventory functions. In fact, Financier II allows you to maintain literally thousands of these accounts, if you desire. And, each account is separately manageable.

"...Financier's interlocking combination of a powerful tax planning package (Tax Series) and a year-round record-keeping program (Personal Series)."

Augustin Hedberg
Money, June, 1983

Financier Tax and Investor's Packages.
Financier's Tax and Investor's Series provide the perfect adjunct to Financier II.

Financier's Tax Series lets you create multiple tax cases, and store them for later adjustment. You can even perform "what-if" spreadsheet calculations, generate graphics and print charts.

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Financier Offers Something for Everyone.
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Financier software is available for IBM® PC, IBM® XT, Digital Rainbow™ and Wang® PC

CIRCLE 241 ON READER SERVICE CARD

No one else is using this simple method to teach you Lotus 1-2-3.

You didn't learn to swim by reading about it. You took the plunge. With a little extra support at first, 'til you could stay afloat on your own.

ATI's training software teaches you Lotus 1-2-3 in the same way.

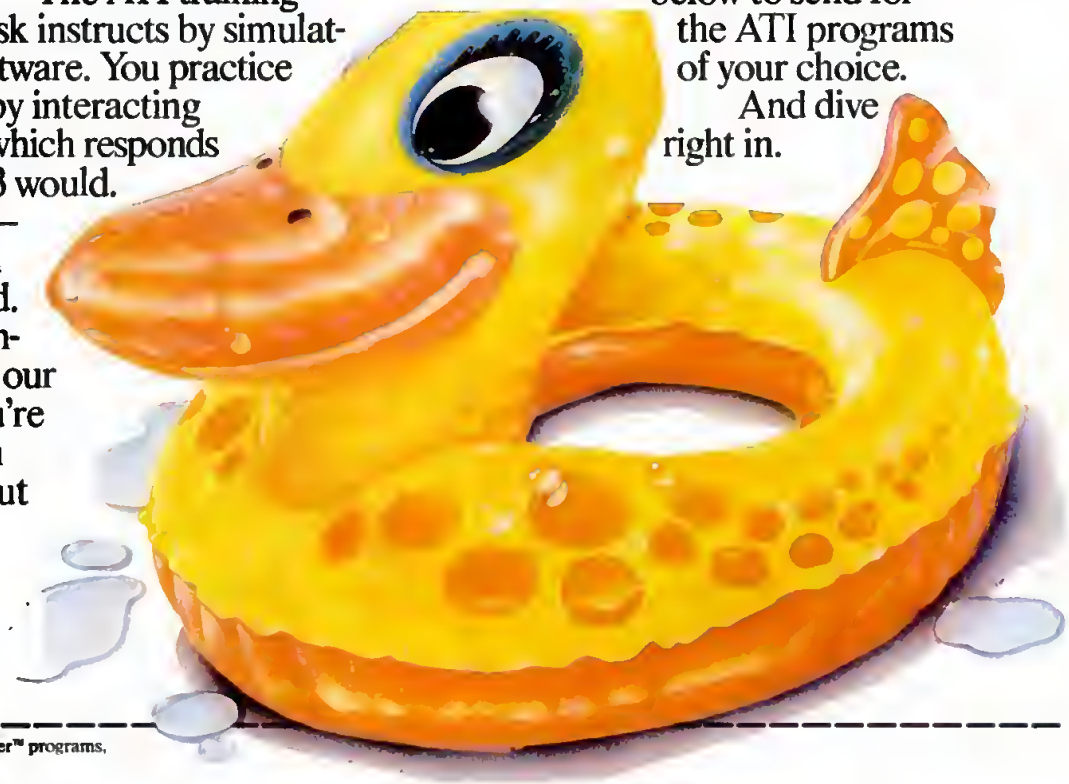
The ATI training disk instructs by simulating the actual software. You practice each command by interacting with the screen, which responds just as Lotus 1-2-3 would.

It's faster—and easier—than any other method. Once you've learned the skills with our helping hand you're ready to swim on your own. Without sinking.

The ATI Training Power package for Lotus 1-2-3, with disk and handbook, is available at your computer dealer. Along with our line of training programs, based on the same simulation method, for other popular software.

Or, use the order form below to send for the ATI programs of your choice.

And dive right in.



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CIRCLE 116 ON READER SERVICE CARD

SPINNAKER'S LINE OF EARLY LEARNING GAMES IS GROWING AS FAST AS YOUR CHILD'S MIND.

Watching your kids grow up is a lot of fun. But making sure their minds grow as fast as their bodies is even more rewarding. That's where we can help. With a growing line of Early Learning Programs that are not only lots of fun to play, but also educational.

Some of the games you see on these two pages help exercise your child's creativity. Others help improve vocabulary and spelling skills. While others improve your child's writing and reading abilities. And all of them help your child understand how to use the computer.

So if you're looking for computer programs that do more than just "babysit" for your kids, read on. You'll find that our Early Learning Programs are not only compatible with Apple,® Atari,® IBM® and Commodore 64™ computers, but also with kids who like to have fun.

FRACTION FEVER™ brings fractions into play. Ages 7 to Adult.

FRACTION FEVER is a fast-paced arcade game that challenges a child's understanding of fractions. As kids race across the screen in search of the assigned fraction, they're actually developing a basic understanding of what a fraction is and of relationships between fractions. They're even discovering that the same fraction may be written in a number of different ways.

All in all, FRACTION FEVER encourages kids to learn as much as they can about fractions – just for the fun of it!

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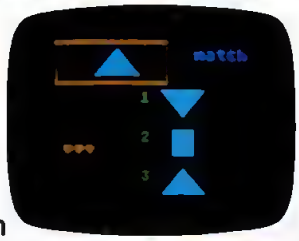
The story of STORY MACHINE.™ Ages 5 to 9.

STORY MACHINE is like a storybook come to life. Using the keyboard, your children write their own fun little stories. The computer then takes what they've written and animates their story on the screen, complete with full color graphics and sound.

STORY MACHINE helps your children learn to write correctly, become familiar with the keyboard, and lets them have fun exercising their creativity at the same time.

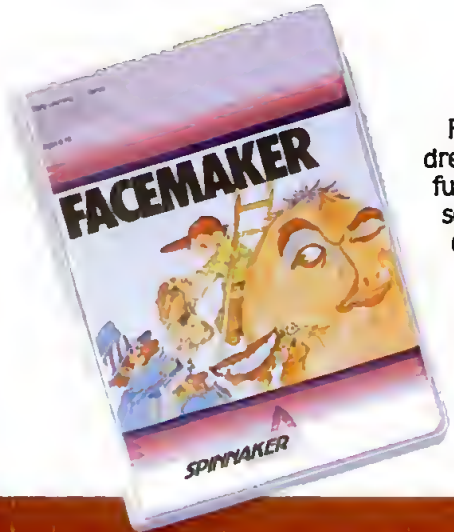
KINDERCOMP.™ Numbers, shapes, letters, words and drawings make fun. Ages 3 to 8.



KINDERCOMP is a game that allows very young children to start learning on the computer. It's a collection of learning exercises that ask your children to match shapes and letters, write their names, draw pictures, or fill in missing numbers. And KINDERCOMP will delight kids with colorful rewards, as the screen comes to life when correct answers are given.

As a parent, you can enjoy the fact that your children are having fun while improving their reading readiness and counting skills.

FACEMAKER™ makes faces fun. Ages 4 to 12.



FACEMAKER lets children create their own funny faces on the screen. Once a face is completed, your children will giggle with delight as they make it do all kinds of neat things: wink, smile, wiggle its ears, or whatever their imagination desires.

Plus, FACEMAKER helps children become comfortable with computer fundamentals such as: menus, cursors, the return key, the space bar, simple programs, and graphics. FACEMAKER won't make parents frown because their children will have fun making friends with the computer.

SPINNAKER™
We make learning fun.

Disks for: Apple, Atari, IBM, Commodore 64.
Cartridges for: Atari, Commodore 64

Incredible Trainers!

No matter what level IBM Personal Computer training you want, our interactive tutorial software gives you the answers. Easier, faster, smarter.

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Both programs use vivid graphic images, creative animation, sound and living color to take you from mystery to mastery of your IBM PC. Each is totally self-paced. And they're "people-literate." So you really do learn.

The most sought-after computer-assisted training anywhere. Available at IBM PC dealers and software retailers everywhere, separately or in a tutorial set. Affordable at a suggested list price of **ONLY . . .**

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or
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Requires MS-DOS, any IBM Personal Computer or Compaq Personal Computer with at least one diskette drive and a monochrome or color display.

Phone and dealer inquiries welcome.

Chart-Master™ turns volumes of complex data into easy-to-understand graphics.

"A picture is worth a thousand words." With this simple concept as a building block, Chart-Master is changing the way busy executives, analysts and secretaries look at, interpret and present information. In a fraction of the time required to wade through volumes of printouts, you can

Values printed at dete points; both left and right Y-exis scales; floating legends & bars; both horizontal & vertical formats; exploded pie sections.

produce easy-to-understand bar charts, pie charts and scatter diagrams quickly and dramatically. Chart-Master makes it easy to customize reports and presentations with six different fonts, label placement, proportional pie charts and more.

Menu-driven Chart-Master allows you to enter data and select a chart format at the press of a button. You then preview your selection on your personal computer screen as it would appear in final form. Or, you can review the various Chart-Master graphic options to make sure you have selected the most effective format. When satisfied, you can transfer your selection to paper or acetate transparencies for a colorful, presentation-quality chart in seconds.

Chart-Master presents a *clear picture* of the "bottom line," which conveyors of information understand and decision makers appreciate. That's why major corporations like GE, Eastman Kodak, Exxon, Union Carbide, GM, AT&T, DuPont, 3M, Citibank, Motorola, Procter & Gamble, and GTE rely on Chart-Master to translate "volumes of complex data into meaningful information."

Chart-Master supports the IBM Instruments XY750, Panasonic VP Series, Houston Instruments DMP29, Yokogawa PL1000 and Strobe plotters, in addition to the Hewlett-Packard family of plotters, for use with IBM PC and other compatible computers.

The retail price of Chart-Master is $375. For a complete information kit and name of your nearest dealer, contact Decision Resources, Inc., 25 Sylvan Road S., Westport, CT 06880. (203) 222-1974.

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CIRCLE 221 ON READER SERVICE CARD

The IBM Personal Computer XT. More power to the person.

Plenty of muscle. That's what the IBM Personal Computer XT means to a person with heavyweight data to manage. Because one of the XT's many strong points is a 10-million-character fixed disk drive that helps give you the power to pump more productivity into your business. What's so special about a fixed disk? Exactly that. It's *already* fixed inside the system, with the capacity to store the facts, figures, names and numbers you need to work with. (Rather than go from diskette to diskette, store up to 5,000 pages of text or up to 100,000 names and addresses in one place.) Yet there's more built into the XT than its fixed disk. Reliability and quality are built in as well. Plus more than 30 years of IBM experience. An exceptional level of price/performance. And a remarkable compatibility of both software *and* hardware with the original IBM Personal Computer. With the IBM Personal Computer XT comes a special tool designed to help you be more productive in high-volume applications.

WHAT'S THE DIFFERENCE?

IBM Personal Computer	IBM Personal Computer XT
BASE SYSTEM*	**BASE SYSTEM***
User Memory 64KB (expandable to 640KB)	**User Memory** 128KB (expandable to 640KB)
Auxiliary Memory Up to two 5¼" 160KB/180KB or 320KB/360KB diskette drives optional	**Auxiliary Memory** One 10 megabyte fixed disk drive and one 5¼" 360KB diskette drive standard

*An expansion unit can also be added to both 16-bit (8088) systems for 6 more system expansion slots. Added to the IBM Personal Computer, it can house two 10 megabyte fixed disk drives. Added to the IBM Personal Computer XT, it can house one additional fixed disk drive for a total of 20 megabytes.

Another tool for modern times to keep you going strong.
To find out where you can see the IBM Personal Computers, call 800-447-4700.
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IBM

CIRCLE 269 ON READER SERVICE CARD

QUADCOLOR™ BY QUADRAM™

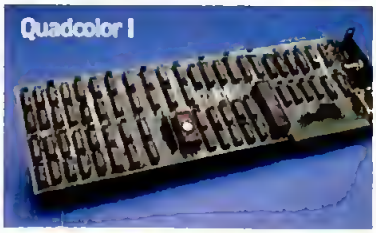
The first and only color graphics adapter board your IBM PC or XT will ever need.

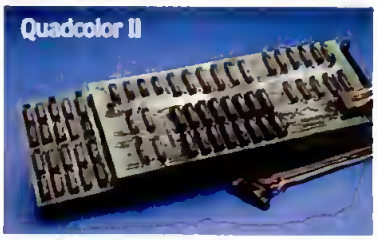
- Most advanced color graphics board you can buy.
- 136 different colors, and expandable memory.
- No additional board or modification needed to run existing software—completely PC-compatible.
- Serves your graphics needs today... ready to meet your expanded needs tomorrow.

Start with Quadcolor I
Quadcolor I adapts to any color monitor and starts you off with 32K of memory. That means that in text mode you get 16 active video pages with a 40 column format or 8 pages with 80 column. Twice as many as IBM's Color Graphics Adapter offers.

When you switch to the graphics mode, Quadcolor I's 32K memory lets you create two complete pages. You can even modify one page while the other is being displayed, for special effects like animation.

Choose 2 true colors for high-resolution displays on RGB monitors. With Quadcolor, there's no reason to limit yourself to black-and-white.





Quadcolor I also offers support for a light pen and an RF modulator connector for use with a home television set.

Grow with Quadcolor II
As your needs change, plug Quadcolor II into Quadcolor I and get a total of 96K of memory combined with higher resolution bit-mapped graphics. Quadcolor II also includes BASICQ, a software package that enhances the IBM's own BASIC capabilities.

Display graphics like a bar chart, and text like graph labels, together on the same screen. Now that's Quadcolor teamwork.

When you're in the mood for fun and games, Quadcolor II has a game port available for your use.

The choice is clear
Quadcolor is the only graphics board that can offer you all these features and the solid tradition of Quadram Quality. Nobody even comes close. So be sure you choose tomorrow's color graphics board today—Quadcolor by Quadram.

With Quadcolor, looking good never looked so good.

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Display shown on screen produced with Quadcolor II.

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CIRCLE 327 ON READER SERVICE CARD

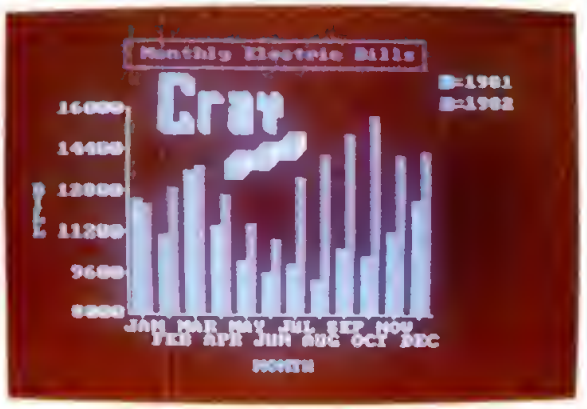
ADD BUSINESS GRAPHICS TO YOUR SLIDE-SHOW PRESENTATION

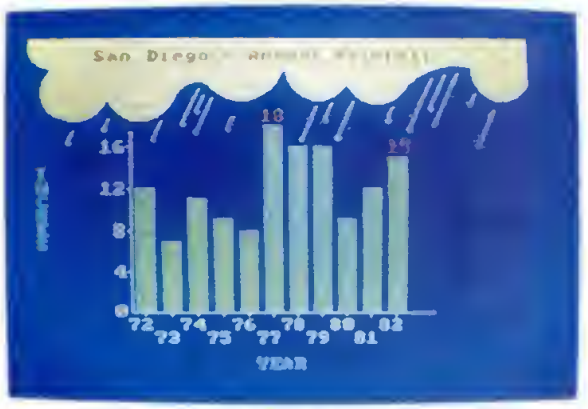
You probably already know that PCcrayon can create colorful screens and slide-show presentations. But did you know that PCcrayon can now create BAR, LINE, PIE, and SURFACE CHARTS with the press of a key. These graphs can be enhanced by PCcrayon's graphics capabilities and used to create animated slide-show presentations.

Generate hard copy on EPSON, IBM, C. ITOH, and PROWRITER printers. Or print in vivid color with Press'n'plot, by American Programmers' Guild. It rotates, windows, combines text with graphics, and changes colors. It's the best yet.

PCcrayon's type font can be displayed at any size, angle, color, or width. You can even create your own fonts and symbols.

Fun and easy enough for a child to use . . . PCcrayon is the Etch-a-Sketch of the computer age. No limits on creativity!





PCcrayon can modify graphs by adding company logos, text, designs, etc.

PCcrayon creates and manipulates many different types of graphics.

A few of PCcrayon's powerful graphics commands.

PCcrayon* "Slide-show Creation and Presentation System" **$44.95.**

PCcrayon** "Slide-show with Business Graphics Option" **$125.**

Press'n'plot for the IDS Prism — regular price **$95.** Our price **$85.**

PCcrayon Manual and Demo Disk **$10.**

*requires IBM or COMPAQ PC, DOS, graphics board and display.

**requires 128K and two drives.

Now in use by several Fortune 1000 corporations.

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The New Generation In Word Processing

OfficeWriter™

Finally, there is word processing for the PC worthy of the business community! OfficeWriter combines exceptional power and simplicity to bring you a word processor for the IBM PC that makes sense—it's easy to learn, easy to use and incredibly versatile.

Until now, most word processors were modeled after WordStar—they were often cumbersome, confusing, and required lengthy training sessions. OfficeWriter is a new generation word processor, patterned after dedicated systems such as Wang and Lanier.

We designed OfficeWriter with the first time user in mind. Our tutorial and practice documents show you how to put OfficeWriter to work immediately.

OfficeWriter's careful human engineering lets you concentrate on writing rather than operating your word processor. You initiate any editing function by pressing a single labeled key—there's no need to memorize complicated command sequences.

And OfficeWriter's dynamic screen formatting constantly adjusts your text, so what you see on the screen is what you'll get on paper.

If you have a problem, our context sensitive "Help" screens provide information specific to the function you're using.

We didn't sacrifice power to make OfficeWriter easy to use. You get all the editing features you expect and then some—like document merge, pagination, and text transfer between documents.

And OfficeWriter is reasonably priced at $325, including our full guarantee

Ask for OfficeWriter at your local computer dealer, or call us to see the difference a new generation can make.

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CIRCLE 357 ON READER SERVICE CARD

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IBM® PC Owners . . .

First we solved your printer problems

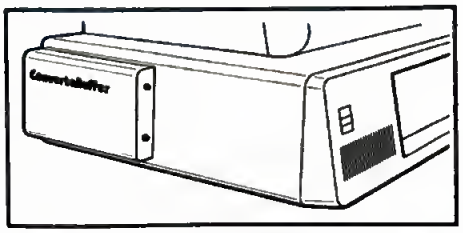
Now we give you graphics

ConvertaBuffer™

IT'S A CONVERTER. There was a time when buying a letter quality printer meant giving up graphics. Now, however, ConvertaBuffer™ gives you the best of both worlds by allowing you to print the business graphs generated by programs such as MBA and 1-2-3 on letter quality printers such as Diablo and NEC. And, the quality of these graphs are as good as those drawn by dot matrix printers such as the IBM/Epson. ConvertaBuffer translates the Epson-format graphics data output from MBA, 1-2-3, and other packages with graphics capability into the format necessary for printing on a letter quality printer.

IT'S A BUFFER. Generating graphics requires the outputting of a large amount of data to the printer. ConvertaBuffer speeds this process by receiving the data as fast as your PC can send it — 1,000 characters per second; storing up to 64K bytes of data in its built-in memory buffer; and then sending it to the printer at the printer's slower speed — 25 to 55 characters per second. This allows you to go on to other work without having to wait for the printer to finish printing.

EASY TO INSTALL. ConvertaBuffer comes with its own built-in cables which plug directly into your PC's printer adaptor and your printer's cable without removing the cover of the system unit — there is no need to buy an extra cable. And, each unit has its own fully regulated DC power supply — the unit does not steal power from the PC or the printer.



ConvertaBuffer also features a convenient front panel switch which resets the buffer to abort the printer output if desired. And, the status light indicates when ConvertaBuffer automatically switches to the graphics mode.

HAVE YOUR CAKE AND EAT IT TOO! The parallel-to-parallel ConvertaBuffer for graphics is the latest member of the ConvertaBuffer family. The original ConvertaBuffer enables you to connect any RS-232C serial interface equipped printer directly into the parallel printer port of your PC with up to 32K bytes of printer buffering.

Ask your dealer about ConvertaBuffer for graphics and the original ConvertaBuffer. Or contact us.

von Leivendyke
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Silvermine Avenue Norwalk, Connecticut 08850 203-848-4973

Please send me further information on ( ) graphics ( ) original ConvertaBuffer.

I have a _____ printer, with ( ) parallel ( ) serial interface.

Name_____ Phone ( )_____

Street Address _____

City_____ State_____ ZIP_____

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CIRCLE 469 ON READER SERVICE CARD

The fundamental technique for highly-accurate diskette software duplication may be summarized in three words:

Call Logic General.

Trained, qualified technicians will first examine your master software to insure that all the original characteristics of its form and content have been retained, and that it will conform to the parameters of the equipment and systems for which it is intended.

Then, utilizing high-speed custom duplication hardware and unique software programs, Logic General will produce and deliver 100, 1000 or 100,000 copies within the time frame you specify.

And each diskette will be identical to the original: a virtual clone. The quality of Logic General duplication is guaranteed 100%.

That is the essence of successful reproduction: flawless technique, combined with prodigious capacity. You will discover both, in equal measure, at Logic General. Where all software is re-created equal.

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ANNOUNCING THE END OF WORD PROCESSOR CONFUSION

It's one confusing business, choosing a word processor. All those companies assuring you theirs is the most fantastic one of all. And leaving you to cut through all the smoke and hopefully whittle them down to the best one for you.

Well, we can help. If you'll just invest the next three minutes reading this, we'll tell you about a word processor that makes picking the right one a real breeze.

FIRST, A WARNING. There are two things you must do when evaluating any word processor. First, be careful. It's no secret that many of today's claims about being easy to learn and use just don't stand up to careful comparison. Watch carefully for complicated codes and programs that require "training sessions." Secondly, be selective. Buy a word processor you can use on a daily basis, not one that requires another "training session" when someone goes on vacation. In other words, be very careful to select the word processor that's absolutely the best and easiest to use. Which is what we'll now introduce you to.

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ALL THE FEATURES YOU'D EXPECT.

WordPlus-PC is both powerful and versatile. Its long list of major functions includes movement of paragraphs, global search-and-replace, and creation of multiple "boilerplate" and personal letters with the touch of a few buttons. There are 3-line headers and footers and automatic page numbering. When you underline or boldface words as you type, WordPlus-PC displays them in that form on the screen. You can merge information created by popular spread sheet programs. You'll create personal letters quickly and easily, or merge name and address information from other programs. You can easily create standard layouts for preprinted forms and use WordPlus-PC to prepare invoices or quotations. For large corporate customers, WordPlus-PC has the capability to merge information from files created by the firm's mini or mainframe computer. You can even type new documents while the system is printing other ones. And you'll find WordPlus fully compatible with virtually all popular ASCII letter-quality and dot matrix printers.

A BREEZE TO LEARN AND USE.

With WordPlus-PC's easy-to-use documentation, you'll be using your word processor right from the first minute. After an hour, you'll feel at home with all the basic functions and ready to explore the more sophisticated ones. After a few hours you'll put the manual away. There are never any complicated or confusing codes to memorize or look up. Rather, the screen's "message area" reminds you how to do what you want. WordPlus-PC's unique keyboard color coding makes things even easier. And whenever there's a question, simply press the HELP function to get back on track.

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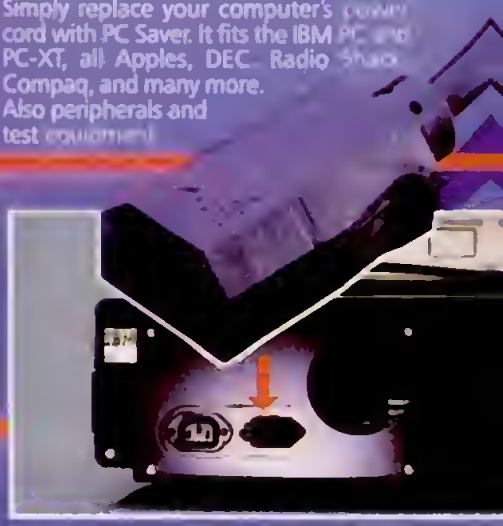

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Linkup automatically executes tasks. It dials, signs-on, runs a job unsupervised and maintains a log of its activities. It uploads, downloads and does printouts while you're away. And when you return, your data is ready and waiting, so you can put your time to its best use.

If you want to communicate, call ITI toll-free 1-800-431-3460 for additional information.

Information Technologies Inc.
7850 East Evans Road
Scottsdale, Arizona 85260
(602) 998-1033

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Linkup Specifications

Speed: 56 Kbps Synchronous, 19.2 Kbaud Asynchronous
Terminal Emulation Modes: TTY, ASCII Block Transfer, DEC VT 52/100, IBM 3101, IBM 2780/3780, and future options include 3270, 5250, Tektronix 40XX.
File Types: ASCII, EBCDIC and Binary.
Automatic Modes: Dialup, Log-on, Job Execution, Answer, Alert, Unattended Job Scheduling
Communications Interface: Dual channel RS232/423 compatible.
Modems: 103, 212, 201, 208 Bell compatible, Hayes, Vadic, Rixon smart modems, or user defined.
Bus Interface: IBM PC bus compatible.
PC Configuration: PC DOS, 64 Kbytes RAM, 160 KB Floppy, monochrome display minimum. Also supports IBM compatible hard disks, color displays and printers.
Options: Printz™ Print Spooler, Postmaster™ Electronic Mail, Audit™ Billing Summary
Base Price: $795 each, including TTY and Asynchronous block software

CIRCLE 240 ON READER SERVICE CARD

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It adds graphics to your IBM Monochrome Display, or 16 high-resolution colors to your color monitor!

NEW IMPROVED!

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***Complete* emulation of IBM's display adapters**

On standard low-scan color monitors:
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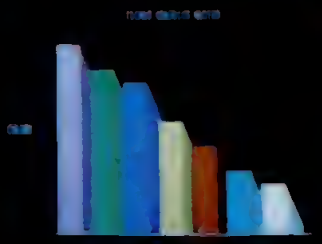
With certain monitors, you can achieve super-high resolutions like 512 horizontal x 420 vertical in up to 16 colors *without interface.*



Graphics Master is equipped with a full 128K of on-board display buffer memory. In low-resolution modes, extra memory isn't wasted. You can divide it up into alternate display screens or use it for general data storage.

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Graphics Master will run with all IBM software for the Personal Computer, including BASIC's graphics commands.

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Phone 216-349-0600/Telex 466692

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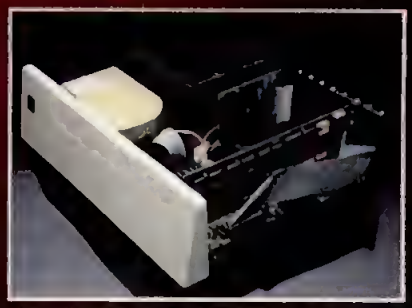

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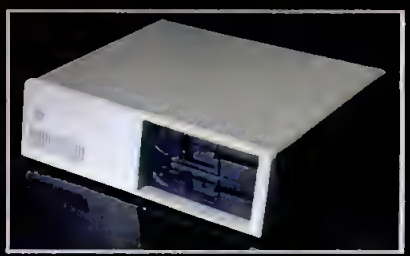

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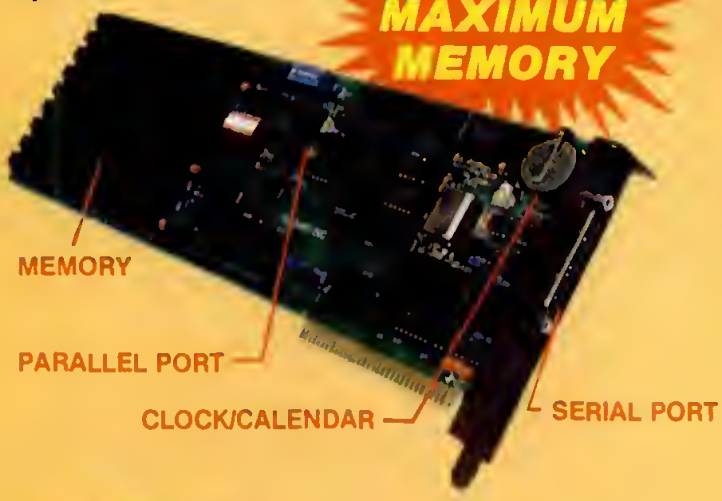

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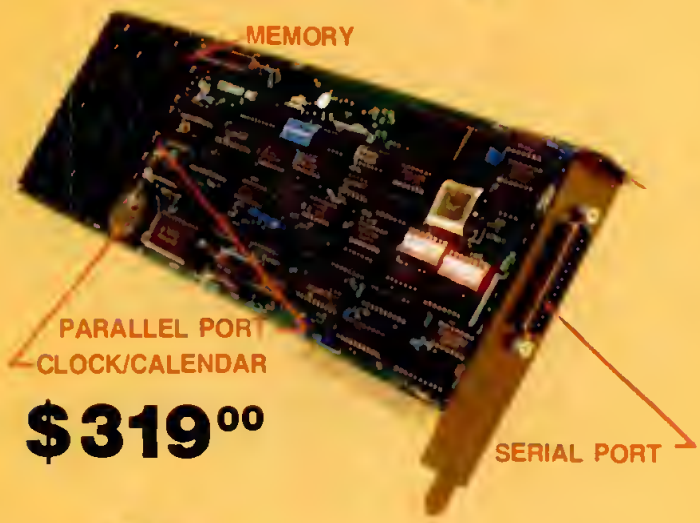

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$319/Unpopulated Memory
$389/64K $469/128K
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Versatile - each 64K fully addressable.

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- **CLOCK/CALENDAR**
- **SERIAL PORT**
- **PARALLEL PORT**
- **RAMSPOOLER**
- **SPEED DISK**
- **AUTO-TIME**
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- Two (2) **PARALLEL PORTS** for printers — PC competible (LPT1, LPT2 or other)
- **CLOCK/CALENDAR** with easily replaceable battery for beck-up
- Accepts exclusive **PAL** Option to restrict informetion on e 'need to know' basis or to protect softwere
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And so we tempt you to take a well-deserved break from the day's stress and frustation. Then you may straighten your tie and head back to the board room. Completely refreshed and invigorated!

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Requires 64K DOS 1.1, color graphics adapter Tachyon double-sided drive. Spyder Hide and Sink single-sided drive

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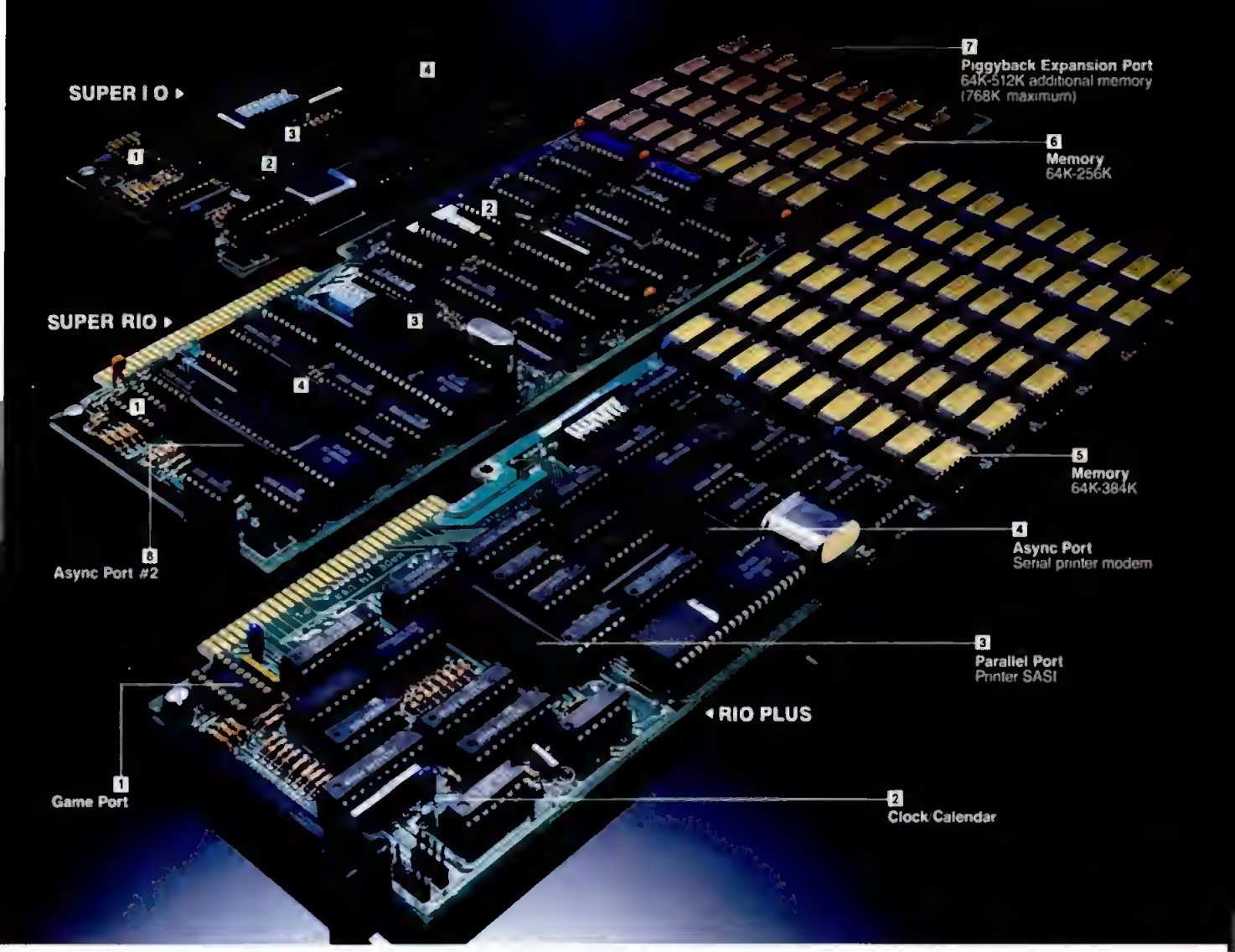
CIRCLE 359 ON READER SERVICE CARD



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The versatile multi-function boards from STB offer more functions and more memory.

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Our SUPER RIO™ combines two asynchronous RS-232-C serial communication ports for interfacing modems, serial printers, plotters, mice, and an almost limitless list of other peripherals, a parallel I/O port for interfacing printers and hard disk controllers, a battery operated clock/calendar that remembers the date and time even when your system is turned off, a game paddle port that can use either APPLE™ or IBM™ compatible joysticks, and up to 256K of additional memory.

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All STB multi-function boards include a serial and parallel cable.
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VERSALEDGER II™ $149.95

VERSALEDGER II™ is a complete accounting system that grows as your business grows. VERSALEDGER II™ can be used as a simple personal checkbook register, expanded to a small business bookkeeping system or developed into a large corporate general ledger system **without any additional software.**

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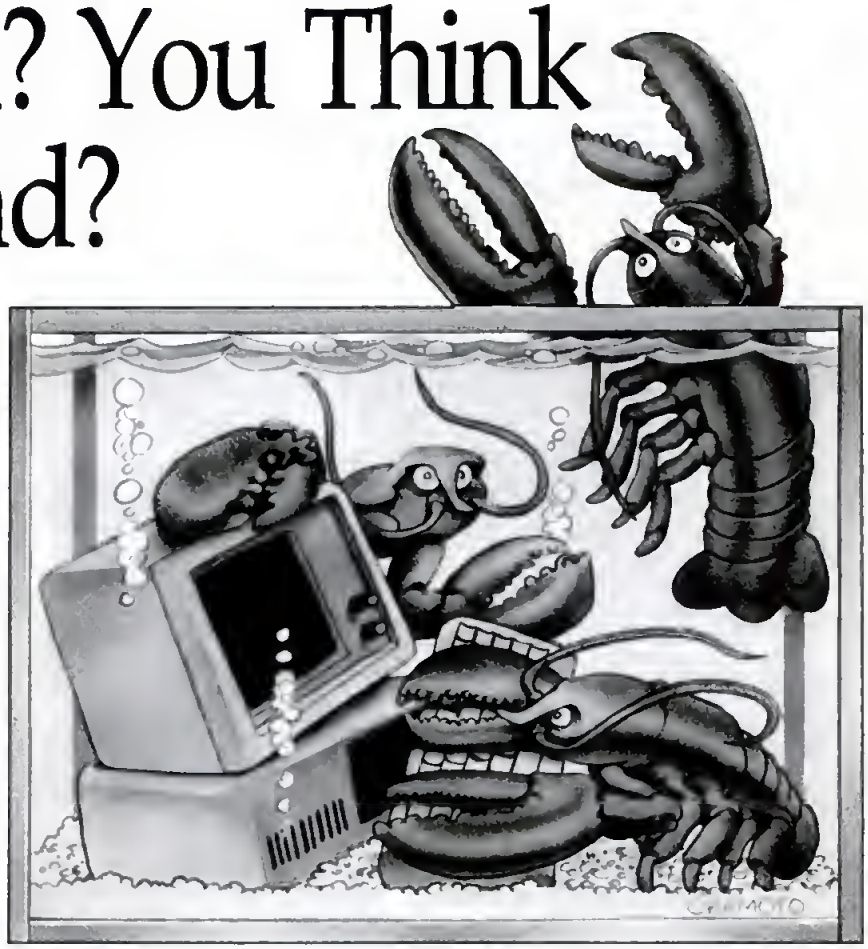
CIRCLE 260 ON READER SERVICE CARD

A PC's close call with a live lobster, a disk drive delivery in the rain, and a white mass of battery acid on my printer board . . . Can you top these tales?

Oh Yeah? You Think That's Bad?



I well remember the day I took home my new IBM PC. There were no neighborhood PC dealers in my neck of the woods in those early deys, and my expensive agglomeration of metel, silicon, and plastic was due to arrive at 7 p.m. in the freight compartment of a DC-9. I had suffered bad dreams all day es I imagined the various mishaps that could befall the boldly marked gray-and-white IBM box heeding my way. I could see it being tossed from loading dock to tarmac and back again; I could see it being skyjacked to Kyoto. I heard the sound of explosive decompression in the skies over Binghamton, and I winced at the thought of my PC being misrouted to Bug Tussle, Oklahoma by e clerk with a vision problem and a migraine.

But those were mere trifles: At 6:30 that night the heavens opened up in a patented Adirondacks summer thunderboomer. It was hard to call it rein, since that definition usually implies a bit of space between the drops. This was more like being trapped at the bottom of a swimming pool.

Live Lobsters

I drove out to the airport about 15 minutes before the plene was due and parked in the lonely lot outside the freight office. I brought an oversized umbrella, a backup umbrella in case of equipment failure, a plastic drop cloth, a set of towels for emergency mop-up, and a look of great anguish.

Right on time, the plane splashed down and taxied toward the hangar. I ran, in broken field fashion, between the walls of water and into the shed. The plane parked 50 feet from the door, and I watched as a besodden baggage handler pulled a two-cart train up to the plane's underside. One cart was an open gondola, the other a covered wagon.

The handler was very gentle with the boxes he unloaded. Through the torrent, I could read the bright red markings: "LIVE LOBSTERS." (I wouldn't want to make a lobster angry, either.) He stacked about 12 cartons on the open cart; I'm sure the crustaceans inside enjoyed the bath.

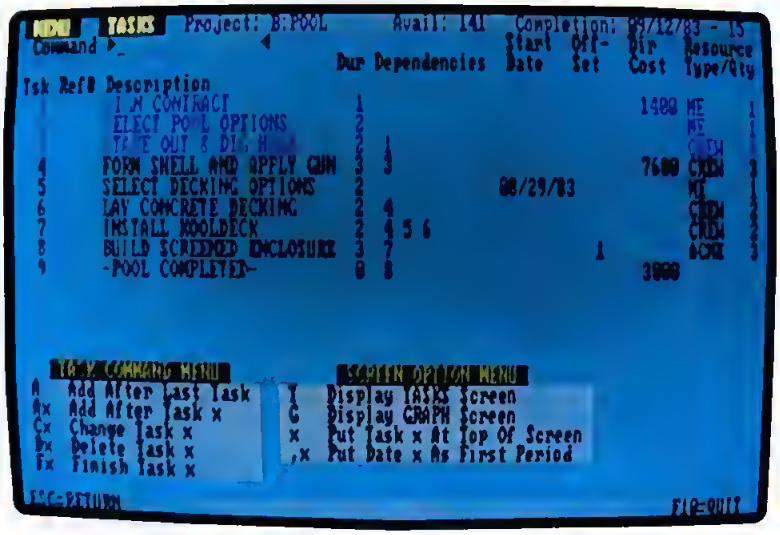
And then he reached deep into the plane's belly and pulled out e large gray-and-white box. Good news! He carefully placed my IBM PC on top of the exposed mound of lobster crates. Bad news!

"That's not a lobster," I sputtered. The freight agent shrugged. "That's a comput-

Illustration: Mike Okamoto

ANNOUNCING:

PRO-JECT 6 *AFFORDABLE PROJECT MANAGEMENT*



FEATURES:

- Critical path automatically calculated
- Time schedule updated in real time
- Immediate "what if" analysis
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- Float time automatically calculated
- Projected completion date displayed after each change
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- Holidays and non-work days can be defined
- Progress can be reported with task completions
- Multiple resource types supported
- User-definable reports
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PRO-JECT 6

CAN ANSWER THESE QUESTIONS:

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- IS THE PROJECT SCHEDULE REALISTIC?
- HOW CAN THE PROJECT BE SHORTENED?
- IS THE PROJECT ON SCHEDULE?
- HOW CAN RESOURCES BEST BE MANAGED?
- WHAT WILL THE PROJECT COST?
- WHAT TASKS REQUIRE CLOSE SUPERVISION?

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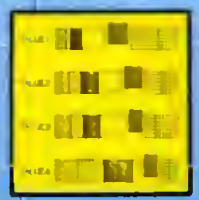
CIRCLE 451 ON READER SERVICE CARD

GRAFOX



*GRAFOX works with IBM BASIC and other comma delimited BASIC files. GRAFOX also graphs DIF files such as those created on VisiCalc, 1-2-3, and DB MASTER.

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CIRCLE 248 ON READER SERVICE CARD

er," I said. He glanced at the bill of leding on his desk and nodded in egreement.

Wben I got home thet night i raced into the house and carted the box upstairs to my office. Rain water and seaweed cascaded off the carton as I opened it. My PC was—I was relieved to find—high and dry, encased in a plastic bag inside a foam cocoon. Still, I swear, in the midst of en occasional midnight deadline frenzy, I can hear e stifled equatic gurgle through the speaker grill.

Topping the Tale

"Oh, yeah? Think that's bad?," asks PC staffer Paul Somerson. He sent his personal computer out for service in Manhattan 6 months ago. It was in its original box, together with all of the original packing material. It came back a few days leter, totally naked, in the hands of a teenege deiivery boy who was using the disk drive slot as a grip. And yes, it was raining.

Paul, not the calmest member of our frenzied and frantic steff, received a noontime phone call from his woman friend. "Your PC got wet," sbe said. "How wet?," Paul calmly shrieked. "About 3 inches of water down around the power supply," she answered.

The people at the service department were very helpful once Paul stopped screaming. He got a whole new set of boards and a plastic bag. And now we all hear gurgles from him when the rains come.

MY PC WAS high and dry, encased in a plastic bag inside a foam cocoon.

"Oh yeah? Think that's bad?," says I. Let me tell you about this product that almost ate my computer.

There wes this super-duper printer buffer on a card that I was supposed to review. Included on the prototype sent to me by the manufacturer was 64K RAM, a parallel printer port, and a clock/calendar. It could mail merge, repeat print, dice, slice, and rice. I plugged it into one of the slots of my PC end let it perk.

Well, it checked out reasonebly well, although it had a few quirks, including a propensity to introduce random misspellings in copy, end an occasional bout with incurable amnesia. But the strengest behavior was reserved for its clock section. It seemed to run on a cycle of its own design: Some days had 23 hours of 63 minutes each; others bad 25 hours of 52 minutes each. But it all balanced out, somehow.

Finally, though, the clock gave up its excursions into the Fourth Dimension and became totally unusable. I mean, a listing of Thursday, January 29, 1966 at 2:32 a.m. was just not acceptable for a Sunday afternoon's word processing in May.

And so, I decided to take out the board. Well, as they say in the technical business, I almost gave birth to kittens as I slid the PC cover toward me. There, on the printer buffer card, where once had been a battery the size of a quarter to power the clock, was now a large wbite mass of battery ecid. I could follow the treil down the board, directiy onto the traces ol my PC's system board.

I'm not sure if I've ever moved so quickly in my life. I vecuumed out every bit of white I could find; I exemined tbe system board for an hour under a high-intensity light, looking for damage. Finally, I said a prayer to Old Man Watson and turned the power back on.

Well, my PC works es well as ever, although I swear that from time to time the name plate giows in the dark.

"Oh yeah? Think that's bad?," says Somerson. "Did I ever tell you ebout the time my cat relieved herseil on my Spinwriter?"

Oh yeeh?

* * *

But seriously—What do you do when the iight goes out? In this issue, PC looks at those who serve, end those who sit and wait. We'll travel with a repeirman, and we'll step behind the counter.

We also present e roundup of some of the zippy, zappy new printers on the market, and we'll sit and listen to the tele of e computer virgin's first BASIC conquest.

If you think that's good . . . */PC*

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True or False: You Can Now Run Apple Software in Your IBM® PC.

☑ True. Introducing Quadlink by Quadram. The revolutionary enhancement board that turns your IBM Personal Computer into an Apple-compatible system.

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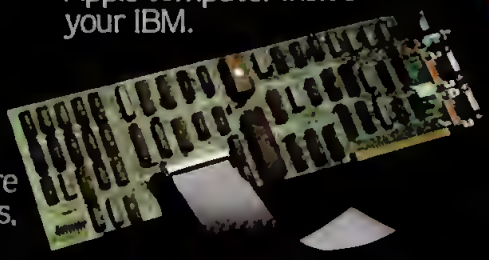

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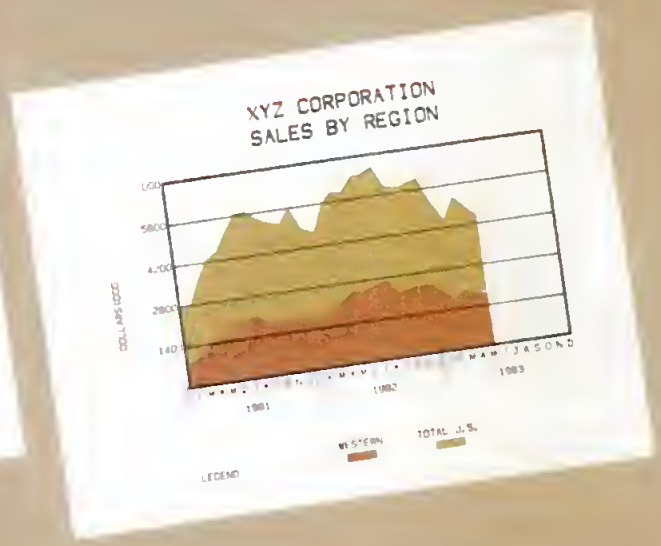

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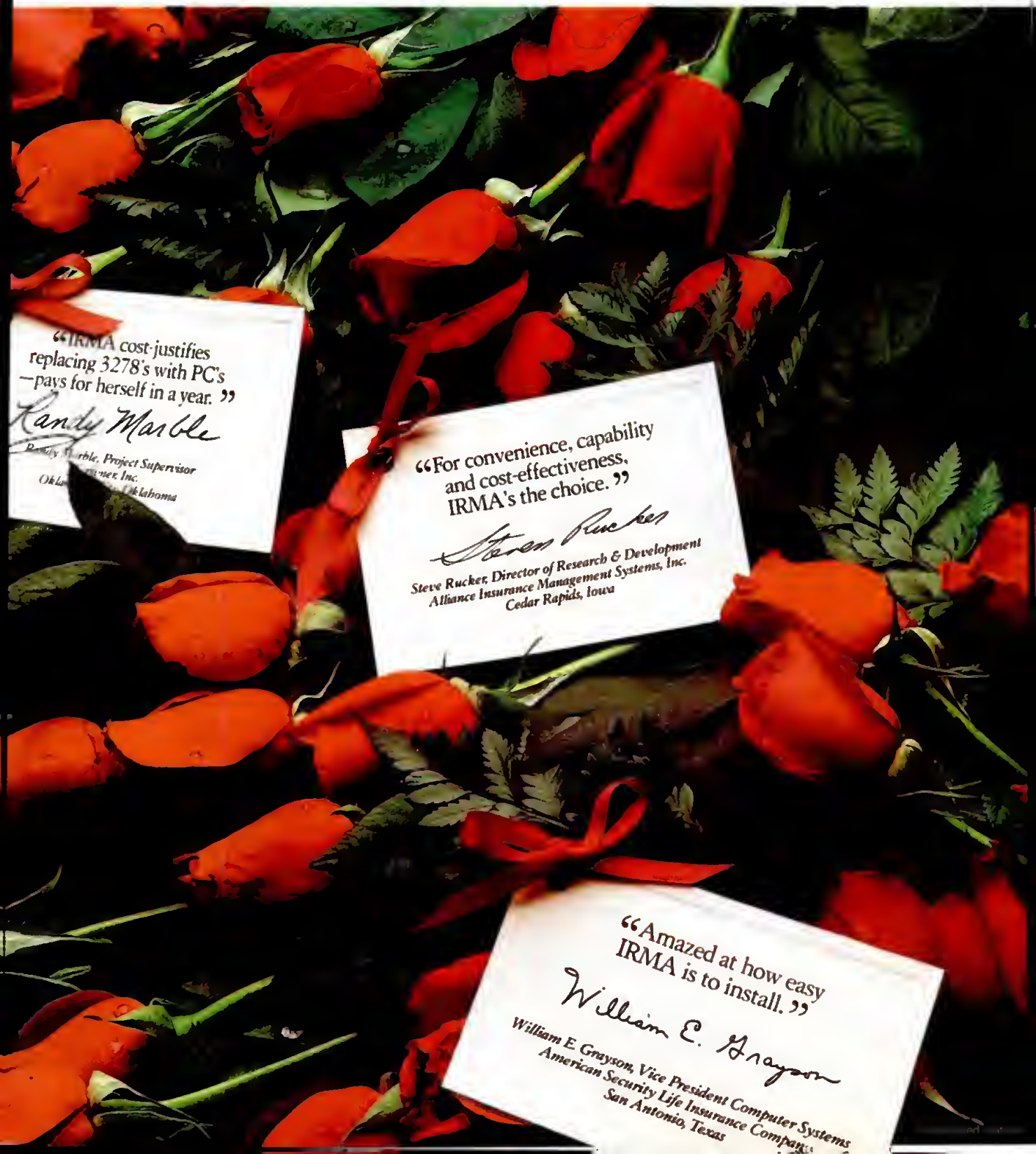

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Letters To PC

Sour Grapes and Rotten Apples

I can never understand why an author writing about a particular microcomputer feels it necessary to denigrate another to make "his" computer look better. Mark Zachmann, in his discussion of the Quadlink board ("Quadlink: An Appleboard For The PC," PC, Volume 2 Number 1) falls into the trap with his gratuitous comments about the Apple II. Zachmann states, "Even the imperfections apparent in a 24-by-40 display designed for color TVs were visible on the prototype configuration." First, as the Apple II has no direct Radio Frequency (RF) output, and is not NTSC standard, it is difficult to say that the display was designed for color TVs. I am curious as to exactly what imperfections Zachmann found and whether they might affect the utility of the board. Unfortunately, Zachmann refuses to share his secret. (Zachmann, for some reason, seems quite hung up on the display. "It signed on with the usual Apple II prompt and the funny looking 24-by-40 display." Just why is the display funny looking?)

But Zachmann really displays his ignorance with the following statement: ". . . apart from games, very little substantive software exists for an Apple." Zachmann does not specify how many programs are more than "little," nor what makes a program "substantive." But if a base of literally thousands of programs for financial modeling, accounting, educational instruction, education testing, statistical analysis, word processing, graphics, information management, and telecommunications, just to name a few categories, doesn't qualify, I'd like to know what does.

Finally, Zachmann ignores what must be one of the most important features of the board: interchange of data in RAM between Apple and IBM formats. VisiCalc files, as Zachmann points out, are relatively portable between computers. But transfer of large files, even at 1200 baud, can take a long time. How much easier to read the file into one system, hit the button to switch the system, and read it out onto the other! But Zachmann was probably too busy thinking of Apple zingers to do his homework.

Although Zachmann amused me, Randy Bannett and Roger Karshaw amazed me with "Fast Recovery From WordStar Disaster" in the same issue. Does WordStar really crash if you try to save a file and run out of room? This is the Cadillac of word processors?

Barry D. Bayer
Homewood, Illinois

Mark Zachmann replies:
Admittedly I'm a little harsh on the Apple, but I have in the past tried to install a number of systems for business people with very little success.

I think the PC is a reasonable—though not wonderful—computer. I don't think the Apple is a reasonable, serious computer. In my opinion you cannot write software in a serious manner for any computer limited to 48K, a 24-by-40 display, uppercase characters only, and an architecturally deficient 6502 processor.

Apple II does have RF output. It's close enough to NTSC standards for color TV, and the display is obviously designed for color TV. Because of limitations in the video display circuitry, you get some smearing of color as you do with color TV.

The interchange of data in RAM is something the Quadram people didn't mention, and it's not apparent to me that it exists.

Huh?

Please send me information on memberships! I have a home in Beverly Hills, California also.

Thank you.

Lawrence Herbst
Milford, Pennsylvania

If you're looking for information about user groups, see "Club News." If you're interested in real estate, we know of a brownstone in Brooklyn.—Ed.

Talk to Me, PC

The "Ultimate PC" article (PC, Volume 2 Number 2) mentioned the PC's ability to digitize, store, and transmit spoken messages."

Have you published any articles on this topic?

Mark Finkel
Murray Hill, New Jersey

See "Comnet For The PC" in Volume 2 Number 3, and "If I Only Had A Voice . . . " in Volume 2 Number 4.—Ed.

Aw, Shucks

I just had to write to tell you how much

Letters To PC

I enjoyed Peul Somerson's two articlas, "If I Had a Million" and "Countar Intelligence" (PC, Volume 2 Number 2). I laughed so hard I actually cried. Somarson's wit end cendor are dalightful. I can only say "More! More!" It's writing like this that will keep PC ahead of the rest of the IBM mags. Keep up the good work.

Steven Lee Feir
Marblehead, Massachusatts

Poul thonks you. His mother thanks you. His fother thonks you. His kindergorten teacher, Miss Jones, thonks you. The editors of PC thonk you.—Ed.

Unprotected Copies

Editor's note: The following is o copy of o letter sent by the outhor to o softwore company with o very populor home finance program.

Enclosed is a copy of your disk, which I produced on my PC using a readily availabla non-IBM backup utility. My reason for doing this was to demonstrete that there is, in fact, no such thing as copy-protection.

It seems obvious thet if it is possible for you to mass produca a "copy-protected" disk, then it must be aqually possible for othars to do so.

After fooling around with (and running) several copies of the mestar disk, I found that:

a. Tha program could be compilad onto a 320K or 360K disk, but would not function because of your copy-protection scheme.

b. Tha mastar disk must be in drive A: and the dete disk in drive B: in order for the series to function. I have sufficient RAM to run the programs from RAM driva C: with tha data in RAM drive D:, but tha program will not permit this becausa of copy-protection and hard coding.

c. After BASIC.COM, COMMAND.COM, end the two system files copied to the 160K master disk, there is insufficiant room for my AUTOEXEC.BAT file for powaring up my hardwere clock, creeting e RAM spoolar, etc.

In case you heven't caught on yet, the irony in this is that your attempts to keep me from reproducing your program hava genereted e myried of operetionel problems and useless restrictions while failing totally at their objectiva. It is obvious that tha antire application was designed around your protection schama, and I furthar resent the portion of the software cost associated with the devalopment and implementation of this scheme.

"Install" programs which copy files onto other disks end dalete them from the originel serve only to generate hardship by restricting users to your predefined configuration. If I owned a hard disk, the anclosure would be your original disk and this lettar would be demending e refund.

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Your packaging states that you will send one additionel copy of tha mester disk, free of charga. Make mine unprotected, please.

Denis M. Castelli
Brewster, Naw York

Clearing the Screen

One of the columns in PC that is most halpful to me is "User-To-User." In Volume 2 Number 2, that column contained a short machine language program to clear the screen in DOS 1.1. However, I discovered that the program did not clear the screen; it just moved tha DOS prompt to the upper left corner of the screen.

Aftar a quick look in my Technical Referanca Manuel, I discovered that somahow one byte of the program was incorrect. Tha byte C6 sbould have been 06. The complete, corrected dete for the progrem should look like this:

B9 00 00 BA 79 24 B7 07 B8 00 06 CD 10 BA 00 00 B7 00 BA 02 CD 10 C3

I would like to thenk the program's author, Gereld Green, for this very nica utility. It makes DOS 1.1 even bettar.

Jamas M. Anderson
Edwardsvilla, Illinois

And thonks to other shorp-eyed readers who cought our typo.—Ed.

Paratroopers

Corey Sandler was unduly critical of Porotrooper ("PC Arcade," PC, Volume 2 Number 2). Sandler stated thet you can't kill tha paratroopars once thay land on the ground. This is not true, and knowing how to do it redically changas the neture of the game.

Wait until another paratrooper is felling directly abova the ona on tha ground. Aim your gun carefully, and shoot off the falling trooper's parachute. He will rapidly fall on the trooper below, and both will ba obliterated.

Whan thare are three troopers on tha ground and several more falling every few seconds, Porotrooper becomes an intansaly angaging game. Just whan it seems you've lost, you manage to knock off ona of the troopers on tha ground. However, the longer you play, the faster come the peratroopers and bombs. (Sandler didn't even mention the bombers!) I don't believe Sendler tried this game for more then e dozen minutes, let alone the "dozan or so" plays he says

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Letters To PC

will cause one to tire of it.

Tom Burka
Burlington, Vermont

Corey Sandler replies:
Burke's secret method of killing porotroopers is o secret to onyone who reads the skimpy instructions to Paratrooper. I tried the gome more times than I wanted to, all in the service of our reoders.

Cover Critiques

Your response to "Sexism Doesn't Sell" ("Letters To PC," PC, Volume 2 Number 3), combined with tha covar of that issue and its attendent pboto, have incited me to write.

If you are truly sincare in your saarch for "another way to take en intaresting picture of a piece of metal, glass, and silicon," than I'm sura you would have no objection to using pictures that would ba "interesting" to the legion of professional women in the computer industry.

How about a muscla-bound, barechested bunk in tight jeans unloading cartons of XTs? Or perhaps e beefcake typa cled only in a knowing smile, modestly holding e box of diskettes in front of himself?

Better yet, why not just exhibit exceptionel intelligence and find e more clavar, testeful way to call ettention to your articles?

Barbara J. Phillips
Fremont, California

Your otharwise excallent megazine too oftan portrays women as sex objects. The cover of Volume 2 Number 3, for axample, may make PC more "interesting" to heterosexual men (I'll admit, it does to me), but in the process it helps shape and maintain antiquatad ettitudes about woman.

Even worse is the ed by Lifeline Information Sarvicas, with a female secretary sitting atop a businessmen's desk beside e computer. The caption: "Do you miss the things that used to be on your desk?"

Sexy covers and ads are fine, but please don't objectify women in the process. It takes soma learning to tall tha difference; I'd be glad to refer you to New York area groups and individuals that could help you.

Portraying women as sax objects is but one form of sexism. Anothar is not taking women seriously, as when you shrugged off Adrienna Florence in "Letters To PC" because hers was "the only letter wa receivad." If nobody et all compleined, you would still have a responsibility to treet women es full, equel human beings. It has nothing to do with offending people—it's e question of sociel responsibility.

Randy Brown
Berkeley, Californie

Some members of our stoff ogree wholeheartedly with your collective sentiments; there is, obviously, at least one member of the art department who feels otherwise. There are, we have found, some PC readers who are unhappy with the cover, but there are also a number of readers—men ond women—who oppreciate the image presented of a woman teoching o closs on computers.

It is ironic that some critics of the cover feel it implies that simply because a woman is beautiful, or well dressed, or possessed of o certoin body type, she is stupid. We don't believe thot, nor do we subscribe to ony other such stereotypes.

In any case, we do offer to all concerned our pledge that there was no intention to offend. The cover, like oll others on all successful mogozines, wos designed to ottract ottention. This one surely did.—Ed.

I must admit to great surprise that Adrianna Florence's letter in Volume 2 Number 3 wes the only response to the offansive illustration thet appeared with your article on the TRS-80 Model 100. I am dismeyed thet rether than taking it seriously, you actually faetured en equally offansive portrayal of a woman on the front cover of that issue.

While I em pleased to see thet you recognize that women ere now in the position of not only using personal computers but also of teeching othars how to use tham, the dress worn by the woman on the covar is unlikely to be worn by eny professional woman performing the task she is doing.

Moreover, the use of en exaggerated V-neck, drawing the eye to the breasts, has long been racognizad as a standard ploy in selling liquor, cigarettes, cars, atc. Whet, exactly, are you trying to sall in your magazina? And to whom? And do you really nead sex to sell it?

Cartainly the meny women in my profession, academics, wbo use computers are not going to be encoureged to look upon your magazine as e source of inspiration or even informetion whan confronted with such demeaning representetions.

Brende R. Silver
Dartmouth College
Hanover, New Hampshire

Learning to Adapt

I am e teacher end e PC owner, end I have published two college texts. I would now lika to edept materiels end approaches from these texts to create a number of programs for use with students.

First, I would like to develop a schools/college version for use by aducational institutions. But I also want to devalop a version to be usad by individuals and their familias. My emphasis is not on speed reading (like the Davison Associetes product) but on reeding retention, vocabulery building, inferentiel skills, end developmant of anthusiasm for the antire reeding process.

I wonder if you could giva ma some informetion on starting a software company to put these idaas to work. I have expertise in reading instruction, and I elso have associates willing to work with me. But I need to know more about the various pitfells of the computer business. I wrote my programs in BASIC, but

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Letters To PC

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Lee A. Jacobus
Stony Creek, Connecticut

For information on creoting your own softwore company see "Modus Operondi: How To Write A Computer Game" by Alan E. Heimlich, PC, Volume 1 Number 8, and "Out Of The Garoge And Into The Corporation" by Dan Remer, PC, Volume 1 Number 9. Also see "The Blossoming Of Computer Aided Instruction" by Richord A. Wolker ond Dann Bergmonn, PC, Volume 1 Number 9.—Ed.

On Norton and DOS 2.0: Mixed Emotions

After reading Pater Norton's latest erticla, "Tha Dark Side Of DOS 2.0" (PC, Volume 2 Numbar 2), I was amazad at how one parson could maintain such a bottomless well of informetion. I would like to thank Norton for ell the informetion ha's providad to help usars of all levels stey on top of the fects and use tha PC to its fullest potantial.

The software development department of my company, Micro Research, has uncovared a coupla of bugs in DOS 2.0 thet we would like to share with your reedars, es well as with Microsoft. We have daveloped soma softwara that was written initially in BASIC and then compiled using tha IBM/Microsoft BASIC Compiler. This software has been davelopad to utilize the maximum aveilable memory in a 128K machine using PC-DOS 1.1. Evarything was fina until DOS 2.0 wes released.

As most users of DOS 2.0 already know, it uses more memory than 1.1. The diffaranca in emount seams trivial, but we wara so close to using the 128K of memory under DOS 1.1 that our system simply would not run under 2.0.

That's whare the glitch comes in. In DOS 1.1, running out of memory whan loading a compilad program prompts tha messaga "Program Too Large." Howaver, DOS 2.0 does not provide thet luxury. It simply runs the disk drive until you finally giva up, turn off your machine, and start ovar.

Tha sacond little problam occurred with a bad compilation using tha BASIC compiler. In the middle of compiling e BASIC program in tha linking stage (using tha ",P" option), some keys were entered from the keyboard in preparation for a future quastion. Becausa of the size of the program to be linked, e VM.TMP fila was being utilized. For some reason this combination of avents triggared tha massaga that an "intarnal failure" had occurred.

Attempting to run this erroneous EXE file under DOS 2.0, daspita the failura messege, produced no error messege. The computer simply sterted putting various ASCII characters in odd locations on the monitor until it finelly lockad itsalf up. Running tha sama bad EXE file from DOS 1.1 produced a simple messege: "Error in EXE file."

It seems es if DOS 2.0 was introducad a little ahead of the finel debugging process. As Norton indicatad, thara are probebly meny more littla bugs in the operating system that will be discovered over the next few months. I hope a more corract and enhanced varsion will become eveileble.

Bruce H. Armstrong
Micro Research, Inc.
Littlaton, Colorado

We think Peter Norton is terrific, too. Last month's issue included Peter Norton's exclusive new column, "The Norton Chronicles," os well os o review of his book Inside The IBM PC, titled "Peter Norton Tells All."

I just finlshad reading Petar Norton's article, "The Dark Side of DOS 2.0." I expectad to see specific axamples of problems and possible solutions, but all I found was Norton's rantings and ravings about vagua difficulties and problems with tha commands and functions of DOS 2.0. The statement thet he has gotten odd results with the Copy commend certeinly isn't very precise.

Granted, thare are inexplicable inconsistencies in some commends, errors in tha documantation, and outright bugs. But we need to see solutions, or at least sufficient information to help us recognize and evoid the problems.

I would have expected Norton to provida e precise definition of eech problam, a dascription of the situation, and possible solutions and/or bypasses.

For example, there is e rather interesting bug associated with the Beckup commend. If the user ettempts to back up tha fixed disk files to e floppy disk and specifies the add option ("/A"), it is possible to get an error indicating thet the diskette is full when in fect there are several hundred thousend bytes eveilabla. This problam only occurs when ettempting to redirect the display output from the Backup command to tha printar ("PRN:").

It eppears that the ectuel cause of this problem is tha invocation of tha DOS 2.0 PRINT command from en AUTOEXEC.BAT file. If tha PRINT command is invoked outside of the AUTOEXEC file, there is no problam. Hance, the bypass for this bug is to remova the PRINT command from the AUTOEXEC file.

It would seem from the tona of tha article that someone at IBM has really upset Norton, or perhaps he is using his old scare tactics again in an ettampt to get us to buy his utilities. I cartainly would hava axpactad more informetion end technicel content in an article by Patar Norton.

Beware, Peter. Your credibility is in danger.

Richard J. Balonek
Secramento, California

It's a Draw

We at PCsoftware wara dalightad to haar thet PCcroyon was to be reviewed ("Tha PC Drews With Templates And Pelettes," PC, Volume 2 Number 1).

Tha review itself was not inaccurata but, in our opinion, it did not give your

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Letters To PC

readers a true idea of what PCcrayon can do, nor did it mention the program's most exciting features.

No mention was made of the incredible ease with which PCcroyon can draw arcs, lines, and circles of various widths. Indicate three points on the screen and you have your arc. Indicate two points and the program will draw your line or circle. No need to write complex BASIC statements, do mathematical calculations, or memorize formulas or commands.

It was stated that PCcrayon images could be dumped with *Graftrox*, but it was not made clear that PCcrayon includes hard copy capability to dump medium or high resolution graphics screens to the Epson and IBM printers.

We agree, in part, that our documentation is not very enjoyable to read, but

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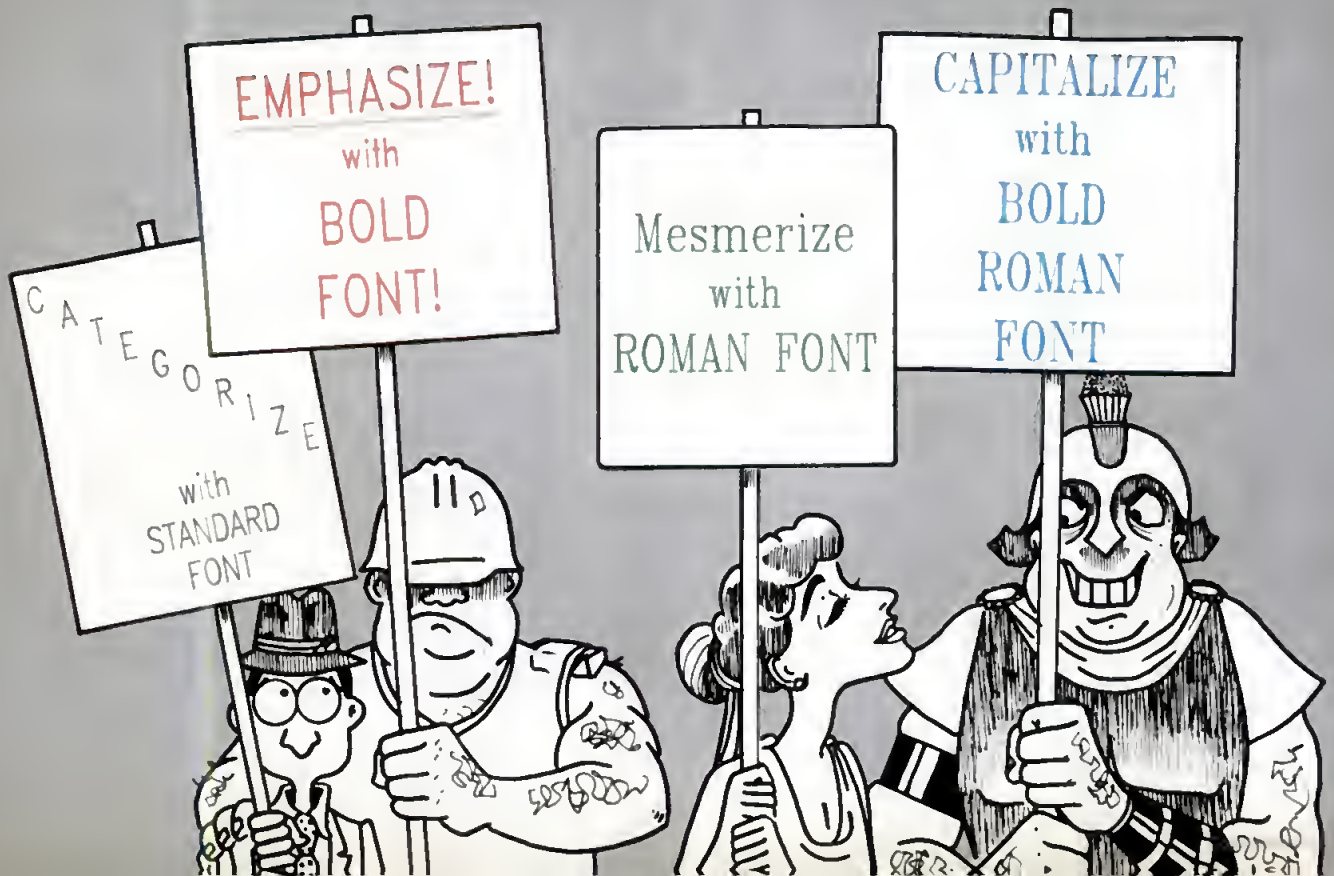

we do take offense at some of reviewer Frank Derfler's criticisms.

PCcrayon's documentation contains all the necessary information, comes with a handy reference card on the inside back cover, and can be read and understood in half an hour. The product also prompts you for every needed piece of information so that a user rarely needs to go to the documentation. A 10-year-old can learn a majority of the commands within an hour. Best of all, PCcrayon comes with a self-running color graphics tutorial that shows and explains some of its capabilities.

We set out to develop PCcrayon with the idea that users could learn from our product. To achieve this, we have made some source code available so that users can access the symbols, type styles, and drawings they have created, and also

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CIRCLE 222 ON READER SERVICE CARD

Letters

laarn more about graphics on the IBM PC. Education is something thet your megazine appears to stress, yet no mantion was made of our afforts in this araa.

Joseph Juhasz
Presidant, PCsoftware
San Dlego, California

Another Virgin's Story

Whan I read of Don Kennedy's adventures ("Baginnar's Luck For The Computer Virgin," PC, Volume 2 Number 2), I found myself thinking that he wes writing my story. If you change a few names, Don and I hed the same experience.

I ended up purchasing my PC at tha local frenchise of a large chain, as they hed everything in stock. When I picked tha systam up I got a pat on tha back and a haarty "good luck." How prophetic.

I arrivad home, quickly sat up the system, and promptly fell flet on my face. My salesperson hed neglected to tell me how to boot up. I had been told, "The manuels are writtan at a sixth grada laval." Great, but I didn't hava a 10-year-old hendy, so it wes up to me to keep reading.

I eventuelly learned, by reeding and working out daily on the keyboard. I have now tamed the beest and faal very comfortabla stroking the keys end menipulating DOS to my tasks.

But tha story doasn't and there. At the recommendetion of my salesperson, I purchasad an expansion board with tha usual skbillion bytes expansion, async port, extra parallal port. . . . To this dey I still can't accass tha second port from any software outside of the DOS PRINT command. The computer store's answer? "Gee, you should call the manufacturer." The manufacturer's answer? "That's a problem with DOS, it's not our problem. Get a copy of *PC* from October or Novamber '82. I think there's a program in there that will halp you."

The one bright spot in all this gloom is thet there is anothar computer store,

about an hour's drive away, and with a salesman who is the answer to my prayers. I go there and ask him rational questions, and I get accurate, concise answers. It's a lot farther to drive, but it's worth it to get the correct information the first time around.

My closing advice to the novice: Ask someone who has been through it before. Caveat Emptor.

John M. Kurko
Levittown, Pennsylvania

Corrections

In the "Benchmarks" section of "Micro-Linguistics: Languages For The PC" (PC, Volume 2 Number 4) the biography of Neil Sarnak was inadvertently dropped. Sarnak provided the Pascal benchmarks that appeared in the article. He is a Ph.D. candidate at New York University's Courant Institute of Mathematical Sciences. He lives in New York City and has written articles for PC and the PC Tech Journal. Of the many languages in which he is fluent, Pascal is his favorite.

In the article "Three Alternative Graphics Boards" by Bill Machrone (PC, Volume 2 Number 2), the price of the *Draftsman* color graphics software package was incorrectly listed as $50. The correct price is $200. *Draftsmon* was developed by the Starware Corporation, which holds copyright and trademark rights for the package.

The program listings that accompanied "Do-It-Yourself Adventure" by Dian Crayne (PC, Volume 2 Number 4) were incorrect. When commenting a line in BASIC, you are allowed to use either a single quote, also referred to as an apostrophe, or the word *REM* (which is short for REMark). However, while you may simply insert a single quote at the end of the line of code and then tack on the comment, you must preface the word REM with a colon. The colons were inadvertently omitted in Crayne's piece.

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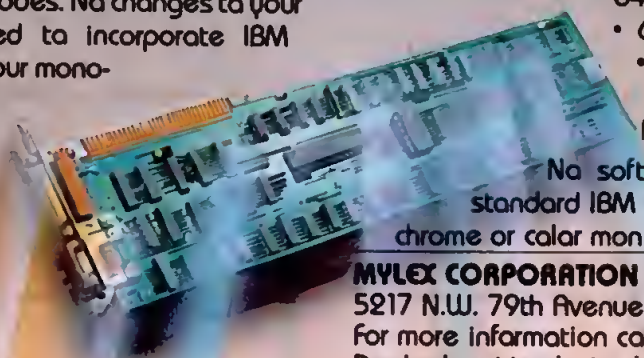

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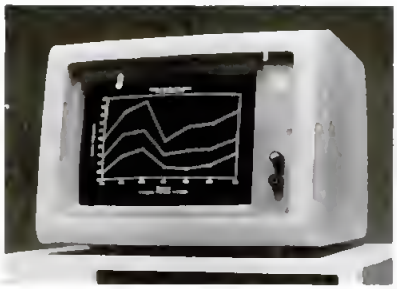

Getting **1-2-3**™ to do graphics on an IBM® Monochrome takes a lot...

Exactly one Hercules Graphics Card.™

What a lot of people have learned the hard way is that you can't run 1-2-3's graphics on the IBM PC monochrome display. That is, until now.

Now, with the Hercules Graphics Card, you *can* run 1-2-3's graphics on the monochrome display. (Of course, 1-2-3's spreadsheet and information management functions work too.)

But naturally the Hercules Graphics Card does a lot more than just make a great program like 1-2-3 better. It gives you high resolution bit mapped graphics on the monochrome display—something the IBM monochrome card simply can't do.

The Hercules Graphics Card replaces IBM's monochrome card giving you text compatibility *or* two pages of graphics, each with a resolution of 720h × 348v. You'll get the monochrome's high quality character set, software compatibility with programs like VisiCalc,® WordStar® and dBase II,™ and a printer interface for any parallel port printer.

Included with each Hercules Graphics Card is software that enables you to use the PC's BASIC graphics commands. Or you can program in other languages and use Graph X,™ our set of assemhly language graphics suhroutines. (Graph X is availahle now for only $50 and includes a graphics screen dump.)

The Hercules Graphics Card. Only **$499.** A small price to pay for graphics on the monochrome display. Call or write for the name of the dealer nearest you.

Hercules Computer Technology
2550 9th St., Suite 210
Berkeley, CA 94710
(415) 540-6000

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HERCULES

Graphics software requiring the IBM Color Graphics Adapter is not compatible with the Hercules Graphics Card. Hercules compatible software from other vendors includes programs for business graphics, CAD, and word processing with scientific characters. Call or write for more information.

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CIRCLE 261 ON READER SERVICE CARD

THEIR IDEA OF AN EASY-TO-USE COMPUTER.

For the name of the dealer nearest you, phone one of these numbers. In California: 800-672-3470, Ext. 938
In all other states: 800-538-8157, Ext. 938. For more information, write Eagle Computer, Inc., 983 University Avenue, Los Gatos, CA 95030.

Apple is a registered trademark of Apple Computer, Inc. IBM is a registered trademark of International Business Machines Corporation.

OUR IDEA.

(Plug it in.)

After that, things really get easy for the Eagle PC user.

Easier because it's faster.

While the other guys are still reading the instructions, you'll be putting your Eagle PC to work. It uses simple English to spell out your choices on the screen. Then guides you through word processing or financial planning. Of course, any number of other IBM-compatible software packages are available for the Eagle PC.

And our PC has many more special function keys for the routine chores like DELETE, ADD, FILE, SAVE and, if you need it, HELP.

Easier because it's more versatile.

We made the Eagle compatible with most of the software and hardware developed for the IBM® PC. But we went much further than that.

We made the main board memory twice as large as IBM's, with up to 512K bytes to keep you growing. We also made our PC smaller, lighter and quieter. Even the price is leaner.

from $1995.*

Easier on your budget.

Eagle PCs start at just $1,995 for a basic system.* The closest IBM, with fewer features, is $564 more.**

So it isn't hard to see why the Eagle PC is such an easy choice. If you'd like to try it yourself, drop into your local computer store. You'll get the idea.

Eagle Model PC-2

EAGLE COMPUTER

Eagle makes it easier.

*Price is for the Eagle Model PC-E, and includes CPU, keyboard, 64K memory, one parallel and two serial ports, and single floppy disk drive. Monochrome monitor, monitor adaptor board, and software are not included.
**IBM price for basic system, serial port and parallel port options. MSRP published price information, June, 1983.

CIRCLE 207 ON READER SERVICE CARD

Our system has converted two world leaders.

IBM-PC and Apple II computers have been converted into the world's first microcomputer postal scale systems to save you up to 15% on postage expense.

Introducing PC Weighmate.™
A microcomputer add-on accessory from Micro General that makes the IBM-PC and Apple II computers manage mail, shipping and inventory counting efficiently—and for a lot less **money.**

A way to cut postage that carries a lot of weight.
The PC Weighmate computes postage rates for letters and parcels instantaneously, either by USPS, International, UPS or Federal Express. It does it with its unique disc software and with a super-accurate 25-lb. capacity electronic scale platform that easily plugs into an available slot.

"Rate Shopper"—Send it the best way—for the least.
Gone are complex rate charts and errors of adding more postage "just to be sure." The "Rate Shopper" feature displays the least expensive or quickest way of shipping a package to any zip/zone in the United States. And, as the rates change, so do the floppy discs. We update them whenever necessary.

Give your IBM-PC or Apple II "Scale-Power."
With PC Weighmate's amazing software. It offers business solutions superior to most available electronic scales that cost thousands of dollars more. PC Weighmate has other uses too. Precision weighing and piece counting with resolution of 1 part in 50,000. PC Weighmate is attractively priced and can pay for itself in just months by eliminating postage errors and increasing productivity.

The system with a following.
Micro General, the largest supplier of postal computing scales to the U.S. Postal Service, is a leader in microcomputer scale technology. That's why we've converted the two world leaders in personal computers!

For additional data or dealership information, call toll-free
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CORPORATION

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CIRCLE 527 ON READER SERVICE CARD

PC-Communiqués

A compendium of facts, news, opinions, gossip, inside intelligence speculation, and forecasts about IBM Personal Computers.

Modem David versus Bell Goliath

Sixteen-year-old Robert Braver nf Norman, Oklahoma, ran into a problem that might affect home computer users everywhere.

Braver received some annoytng, anonymous messages on his computer screen. He asked the phone company, Southwestern Bell, to put a trace on hia telephone line to find who was responsible.

Braver's request led Southwestern Bell to notice that his telephone was connected to a modem. As a result, Braver's basic monthly phone bill jumped from the standard residential rate of $8.95 to $52 once Southwestern Bell began charging an Information Terminal Service Tariff. The terms of thia sun:harge, enacted in 1965, don't distinguish between home and commercial users of computers.

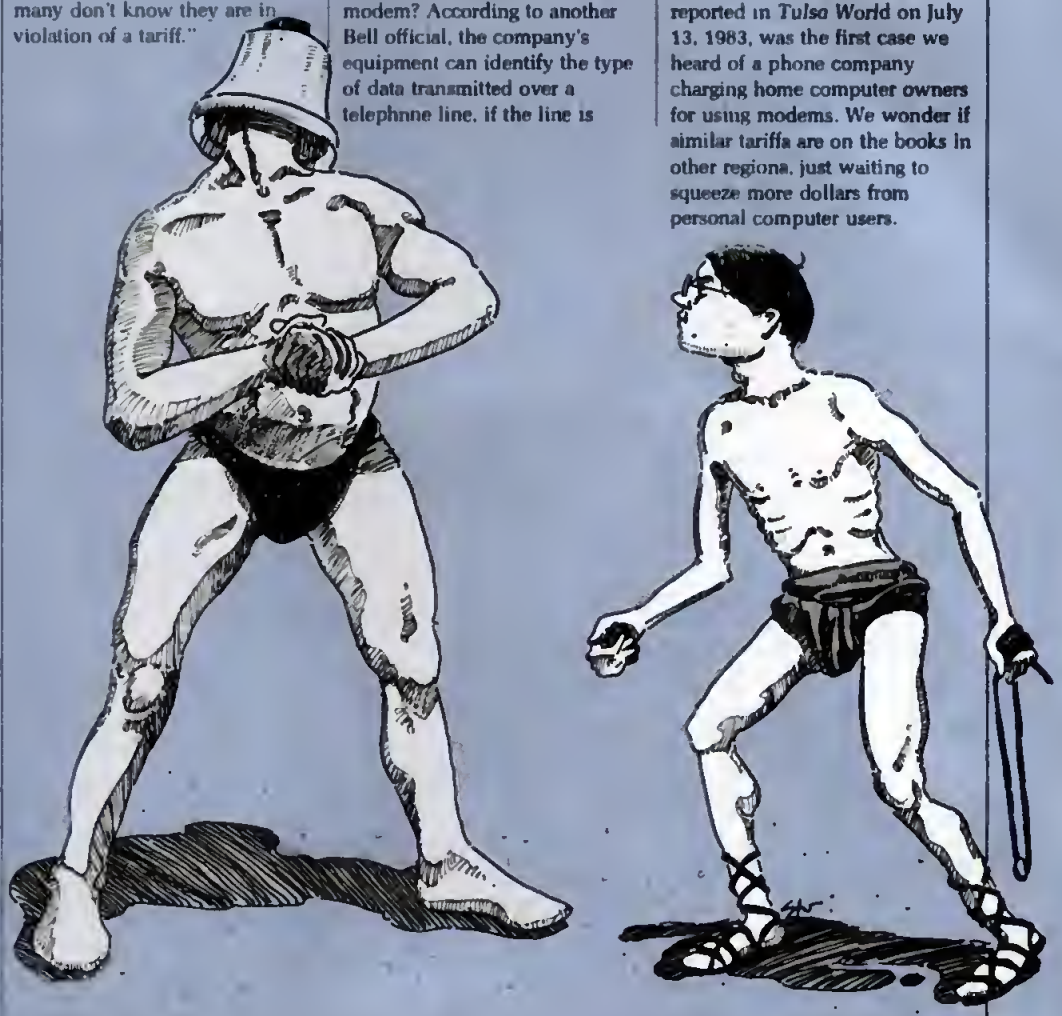
Braver said, "They shouldn't be charging me extra It's ridiculous I had registered the equipment. They knew I had a modem. But they called up my records, reviewed my case, and started charging me at the higher rate. If Bell can get away with charging anything extra, they will. You can protest all you want, but they don't care."

Against these odds, the Oklahoma Modem Users Group has come tn Braver's defense. Its members voiced objections to the terminal tariff on June 30 at a meeting in Oklahnma City, where Southwestern Bell's rate application was under discussion.

Ed Terrell, a spokesperson for Southwestern Bell, stated a justification for the tariff. Modem users "tie up the telephone lines more. Their transmissions can last for long periods of time." Terrell added, "I suspect there are a lot of households with this type nf equipment, and a great many don't know they are in violation of a tariff."

Can the phone company tell if you're using a tariff-violating modem? According to another Bell official, the company's equipment can identify the type of data transmitted over a telephnne line, if the line is monitored at the right moment.

Robert Braver's dilemma, reported in *Tulsa World* on July 13, 1983, was the first case we heard of a phone company charging home computer owners for using modems. We wonder if aimilar tariffs are on the books in other regions, just waiting to squeeze more dollars from personal computer users.



The World's Most Expensive Micro?

The New York Times, which ought to know better, recently reported that two major computer companies had "announced new microcomputer products."

True enough, Honeywell's computer division was said to be bridging "the gap between its single-user $5,000- to $10,000- computers and its larger multi-user systems that are priced at $40,000 or so," with its DPS 6/40 at a pricev $27,000, and its 6/20 for a bargain 17 grand.

However, the supposed "microcomputer" eotry from Prime Computer Inc. is its Prime 9950, a slick piece of hardware that can be yours for only $392,500 (delivery extra). Finally, here is a micro every home user would like to have resting on his desk, especially since it delivers "50 percent greater system level performance than its former high-end system, the Prime 850," which has been selling for $389,000.

This should forever silence the criticism by mainframers that you can't take micros seriously. Or hasn't *The Times* learned that not all "microprocessor-based systems" are microcomputers?

PC-Communiqués

From the Keyboard to the Skies

"As I em an airline pilot, one program I just had to try on my PC was Microsoft's *Flight Simulotor*.

"I didn't anticipate that tha program could equal the $6-million simulators that we have at our Flight Academy for aircraft like the DC-10 or Boeing 747, but I was pleased with its realism.

"Microsoft's game certainly can't replace flight instruction, but it does give a good foundation for some of the principles thet often trouble a beginner. If you pull the throttle off to slow down, for instance, the nose will drop and you'll keep your airspeed unless you ease back on the wheel. If you put aileron in, the aircraft will continue to roll until you neutralize the controls. If you wrap the aircraft into a steep bank, you're going tn lose speed or altitude.

"Instrument-scan habits are hard to build for many pilots learning to fly on the geuges. The biggest problem students had when I was teaching advanced iets in the Navy was learning to look at the right instrument at the right time. The 'Basic T' layout in *Flight Simulotor* is the same one that we use on the biggies. Learning where to look wben you're in the broth is Lesson Number One—it can be learned from *Flight Simulator*.

"In sum, *Flight Simulotor* ian't 100 percent real—you'll never need a barf bag with it. But it would be good preparation for anyone before starting to take those $60-an-hour lessons."

—*Dan Robinson*

Personal Style

Nicholas Negroponte of MIT predicted the rise of the personal computer back in 1968 in his book The Architecture Mochine. Since then he's not neglected microcomputers; in the 1980s he helped teach an Apple to speak Wolof, the language of a Senegalese tribe with an axclusively oral culture.

Negroponte told W, the fashion newspaper, his vision of the graces computers must ecquire before they can be good companions for human users. "Computers sbould be gregarious, friendly, and fun. You should be eble to talk to a computer ebout things that are in some sense totally sensory. If a friend, for example, tells you a certain car has e good feel for the road, you understand because you've experienced it. And meybe e decade from now you'll buy a particular computer because it has a better sense of humor than another."

Until that time comes, the Information contained in the shrug of a shoulder, a raised eyebrow, or a puzzled tone of voice cannot be accessed by our PCs.

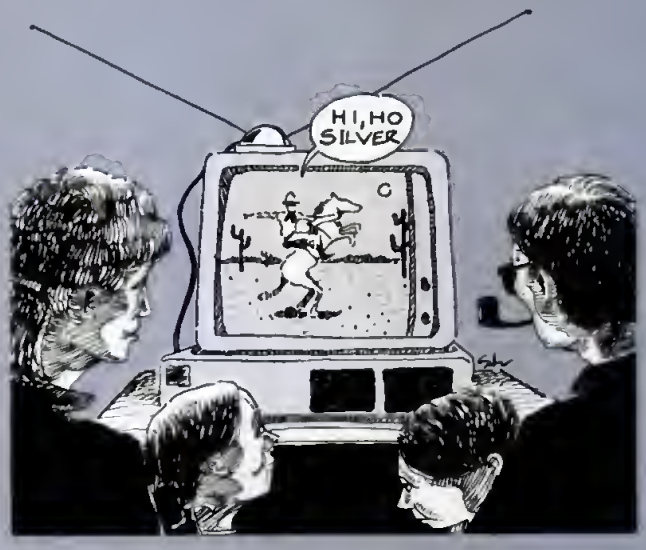
PCTV

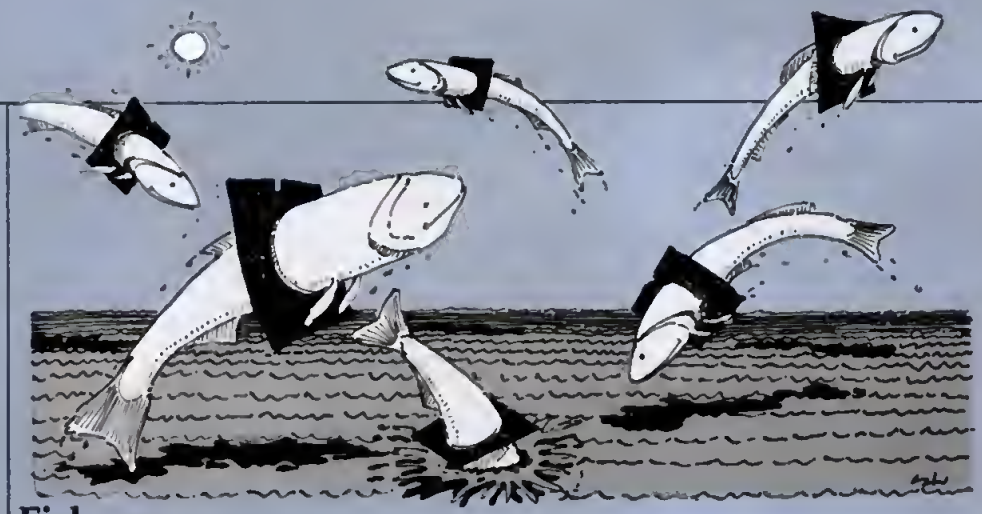
Most people, on first encountering a personal computer, gaze at the monitor and say, "It looks just like e talevision." You still can't pick up "Bonanza" reruns with an IBM color/graphics adapter; on the other hand, personal computers themselves are appearing more often on television screens. Admittedly, we're not likely to see a situation comedy called "Diff'rent Keystrokes" this season, but several computer shows have been produced for syndication on public television stations around the country.

Until tha and of October 1983, PBS is offering "The Computer Program," a ten-part series, produced by the ubiquitous BBC, in which a computer expert coaches a beginner to achieve computar literacy.

This fall, elso look for "Bits, Bytes, and Buzzwords," e program from KQED in San Francisco. According to its publicist, the show tells you "everything you always wanted to know ebout computers, but were afraid to ask your kid." "BB&B" is hosted by Jim Hartz, formerly of "The Today Show" and KQED's "Over Easy."

Other television micro-series are in the works. PBS is using part of e $150-million grant to produce "The New Literacy: Introduction to Microcomputers," and New York City's WNET is developing a "TV Academy On Computing." Both are scheduled to air in January 1984.





Fishware

We hear a lot of fishy claims in the computer business these days, but this one takes the prize: "Now the samo kind of mainframe DBMS power that tracks our nation's salmon is availablo for your IBM PC."

That whale of a boast is the headline on a recent ad for a database-management system. The copy states that this software is used by the U.S. Fish and Wildlife Service, but we're not sure exactly how; the glistening silver swimmer splashed across the four-color page gapes insouciantly, but it looks like a fish out of water.

(The software manufacturer may have been puzzled by this ad as well; we've heard it's preparing a new fish-free campaign to lure customers.)

We're not sure what school of writing inspired this striking ad copy, but we wonder what's next in micro-advertising. . . "Now! A graphics program that scales automatically!" Or, "The word processor that strung together a best-selling mystery writer's red herrings." Or, "When you've got too many haddocks on your mind, *PiscaFile* is better than aspirin."

If the likes of these lines are on line, we just hope that the salmon doesn't spawn a trend.

—*Stephen Manes*

Return of the WordStar Update Update

MicroPro has announced the latest change in its update policy for *WordStar* 3.3 and the companion versions of *MoilMerge* and *SpellStor*. Henceforth, updeted copies are available to current owners of older versions at the price of $85 for *WordStar* and $25 each for *MoilMerge* and *SpellStar*. Customers who purchased earlier versions after April 1, 1983 may exchange them for new disks at no charge.

Until recently, MicroPro charged $85 for updates of each of the three programs—a total of $255 for the set. Perhaps MicroPro became eware that discounters were selling fresh copies of *MoilMerge* a few months ago for as little as $79.

According to a MicroPro spokesperson, the company initially set the price of the updates at $85-$85-$85 "in order to cover our costs." It makes you wonder if the price of three-ring binders has skyrocketed ell that much.

To obtain the updated versions of the programs, first obtain an Update Authorization Card from MicroPro by calling (800) 227-5609, or from any of its dealers or distributors. Then you can give the card, payment, and your initial disks of the old versions to your dealer; however, the turnaround should be faster if you send them directly to MicroPro's Update Department, Box 4960, San Rafael, CA 94913.

—*William Howard*

Manual Assistance

If you're tired of reading badly written software manuals, you can share your misery with a lot of company. But if you're a manufacturer who's tired of producing inadequate manuals, there's a newsletter that can help you reform.

Documentation Etc. is a bimonthly publication featuring advice on preparing documentation and promotional materials for data-processing products. In addition to articles on graphic design, organizing information from the start of a software project, and writing with consistent use of terms, the issues include questions and answers such as the following exchange:

"Q: Why do you keep saying that documentation is expensive? My secretary writes most of our users manuals during her free time.

"A: If your secretary can write the quality of manuals we're talking about, she's grossly underpaid!"

Request a sample copy of *Documentation Etc.* or send $30 for a year's subscription to Science Information Associates, Crestmark Office Complex, 350 South 333rd, #102, Federal Way, WA 98003, (206) 838-2835.

Homewrecking Computers

This July, "PC-Communiqués" reported what we hoped was a one-of-a-kind story—the tale of a marriage wrecked by the husband's passionate involvement with his IBM PC. Imagine our relief, then, when we noticed a wire service article claiming that 2,000 Syracuse University students had been polled about the ten most

important elements in any marriage. Rated number 1—ahead of simultaneous orgasms, perfect children, and even microwave ovens—was the home computer. Could this domestic

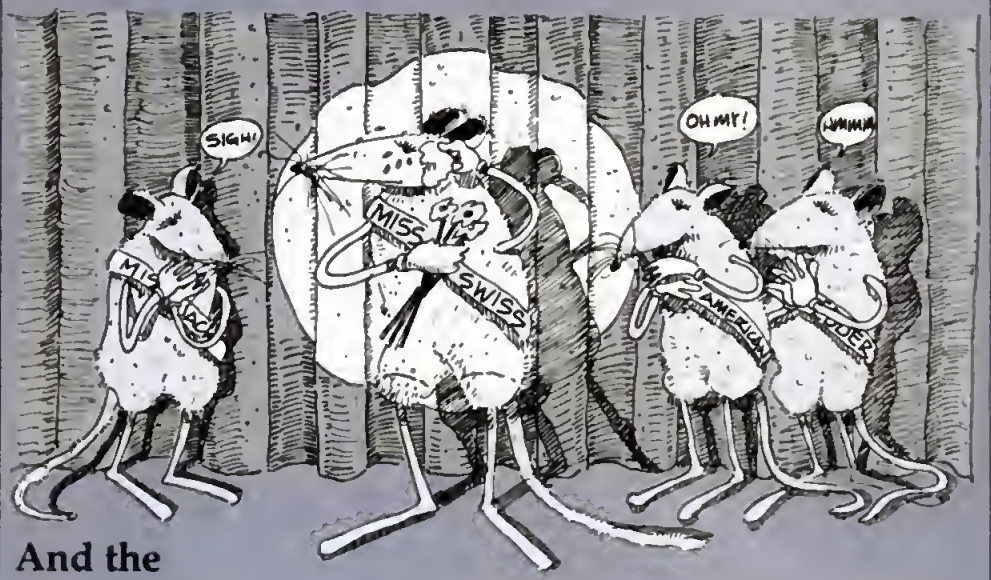
PC-Communiqués

device be the same as the aforementioned malevolent home breaker?

Eager to learn more, we called Dr. Sol Gordon of Syracuse's Institute for Family Research and Education, the supposed originator of the study. Dr. Gordon said that although he has done a lot of studies, the one the wire service quoted isn't one of them. That "survey" was actually only an informal list, made up on the spot at a reporter's request for a joke.

Actually, Dr. Gordon said, his serious work indicates that home computers may be cited more and more as a cause of marital tension. It is males, almost exclusively, who become obsessed with home computers. The machines display a remarkable power to distract husbands from home and family—as effective as televised football. Says Gordon: "A lot of men are using computers as an advoidance of marriage."

—Koren Cook



And the Winning Mouse Is. . .

Summagraphics, Inc. and Mouse Systems Corp. were selected by VisiCorp to supply the mice that will be used in the VisiOn open application system. This mouse is slightly larger than a deck of playing cards and has two buttons for selecting boxes and moving a window on the VisiOn screen. (The standard mice of these manufacturers have three buttons.)

It is an optical mouse; the user moves it across a 9- by 11-inch mirrored plate ruled with red and infrared lines that are read by the mouse's sensors to define cursor movement.

The mouse for the VisiOn system will include encrypted information, unique to each device, that will be used by the VisiOn program for software protection. A disk of VisiOn software can be operated only by a mouse with the same serial number as embedded in the software.

To find more about VisiCorp's prize pet and other mice, contact Summagraphics, Inc., 35 Brentwood Ave., P.O. Box 781, Fairfield, CT 06430, (203) 384-1344; and Mouse Systems Corp., 2336-H Walsh Ave., Santa Clara, CA 95051, (408) 988-0211.

A Real Software Library

Microcomputer fans have a new computer reference resource—the National Software Library, which is open to any member of the puhlic whn wants to test software on one of the facility's 40 microcomputers. The main customers are expected to be from business and user groups. The library opened on June 15, 1983, with about 15,000 software packages on hand. The institution aims to collect every available piece of snftware with its accompanying documentation.

Does this mean that software is getting the same respectful treatment as all those volumes preserved in the Library of Congress? Not quite. The library was created by the same entrepreneurial spirit that characterizes the computer industry. It was founded by Larry Stockett, the owner of PC Telemart, Inc., which publishes the PC Clearinghouse Software Directory. Software maoufacturers sent him copies of many of the 21,000 products listed in the directory, so Stockett found that a software library virtually fell into his lap. Memberships in the National Software Library are now selling for $300 per year or $100 for a quarter. "We expect to make a profit," says a PC Telemart spokesman. The library is located at 11781 Lee Jackson Highway, Fairfax, VA 22033, about 20 minutes outside of Washington, D.C. For mnre information, call (703) 352-0722.

—Koren Cook

PC-Communiqués Pays

Do you have news, gossip, or unusual computer tales for "PC-Communiqués?" We will pay up to $50 for each submission used. You must include your name, address, and telephone number with the item. We will preserve your anonymity if you wish. All submissions become the property of PC and are subject to editing. Our "User-to-User" section also publishes and pays for readers' submissions; that section features tips, problem solutions, and short programs or routines. Please send submissions to the appropriate department—PC-Communiqués or User-to-User—at PC, One Park Ave., New York, NY 10016.

NEW EXCITEMENT FOR YOUR IBM* PC!

J-BIRD

It's new! A battle of quick reflexes and wits—not firepower.

Your goal is to change the color of your world. But first, you must maneuver around hoards of hazards: outjump King-Bo the snake, dodge mind-globes, outsmart Hob and Nob when they try to slow you, and pursue the time epheres in your world. It all makes for more fun than you've had in a long time!

Special features include: incredible graphics and sound; joystick or keyboard operation; two player option; on/off sound; joystick calibration; high scores saved on disk.

J-BIRD is written totally in machine language for beautiful, smooth animation. Multiple play levels make J-BIRD a game that everyone can enjoy. Requires color graphics adaptor & 48K RAM.

PC-MAN AND THE MICRO MONSTERS

Beautiful colors! Arcade quality graphics! Stunning resolution! Exciting music and sound! Need we say more!

Written entirely in machine language for smooth animation. Requires color graphics adaptor and 48K RAM.

WIN AN IBM* PC!

That's right! Send us your best game and enter the ORION SOFTWARE *FUN FOR ALL* Contest. We'll be giving away an IBM Personal Computer—and you could be a winner! Call or write to ORION for contest details today!

ORION SOFTWARE

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Available at ComputerLand and other fine PC dealers.
For your nearest dealer, or to order direct call: **1-800-821-8088.**

To order by mail send $34.95 for PC-MAN, or $36.95 for J-BIRD to: ORION SOFTWARE, P.O. BOX 2488, Dept. 283, Auburn, Alabama 36831.

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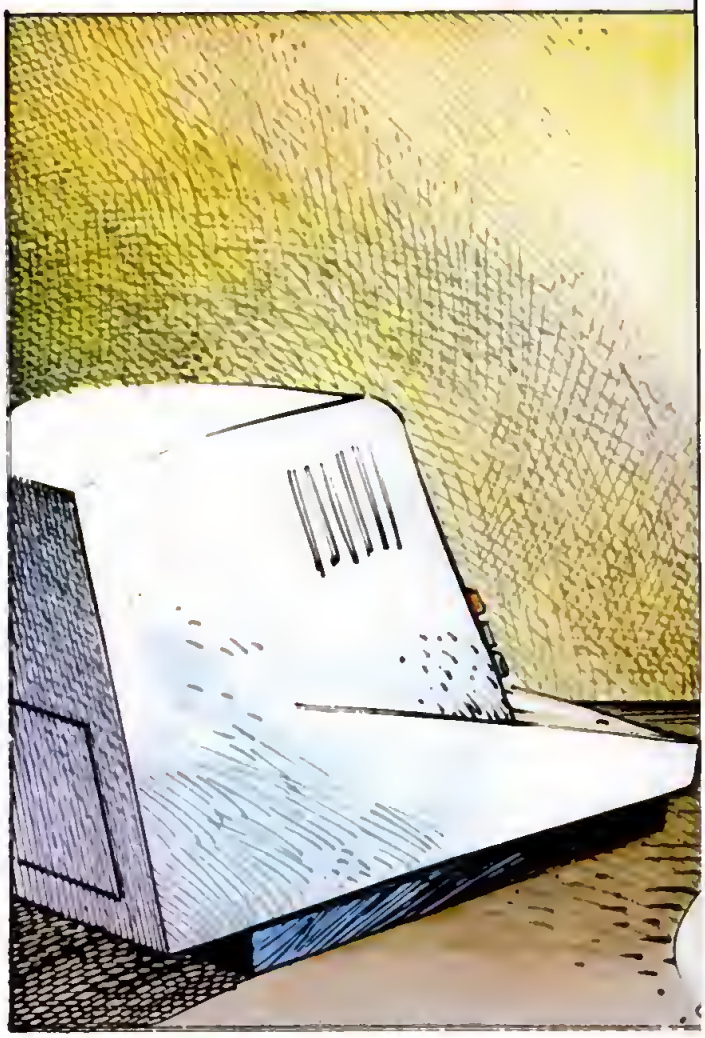
CIRCLE 349 ON READER SERVICE CARD

Get everything



I'm a pretty smart guy.

I've been Office Manager for only six weeks and I've already scored an impressive coup:

I talked the old man into investing in some office help that's already paid for itself.

And now we're getting everything done by Friday! Every single day of the week.

That may sound confusing but it really isn't. Because Friday! is the revolutionary new electronic file handling system from Ashton-Tate, the people who invented dBASE II™

Friday! runs on your microcomputer and it's made for people like you and me, people who know their jobs but who don't know much about computers.

I won't go into great technical detail about Friday! because there isn't any. I just follow the English-language instructions on the screen, push a few buttons and—Zap!—I get the job done. With incredible speed because we've turned our paper files into much more efficient "electronic files."

So whatever I need to know, I can find it in seconds.

Sales by product, salesman and territory since the first of the year.

Time billing for work in progress last month.

A quick report on our accounts payable.

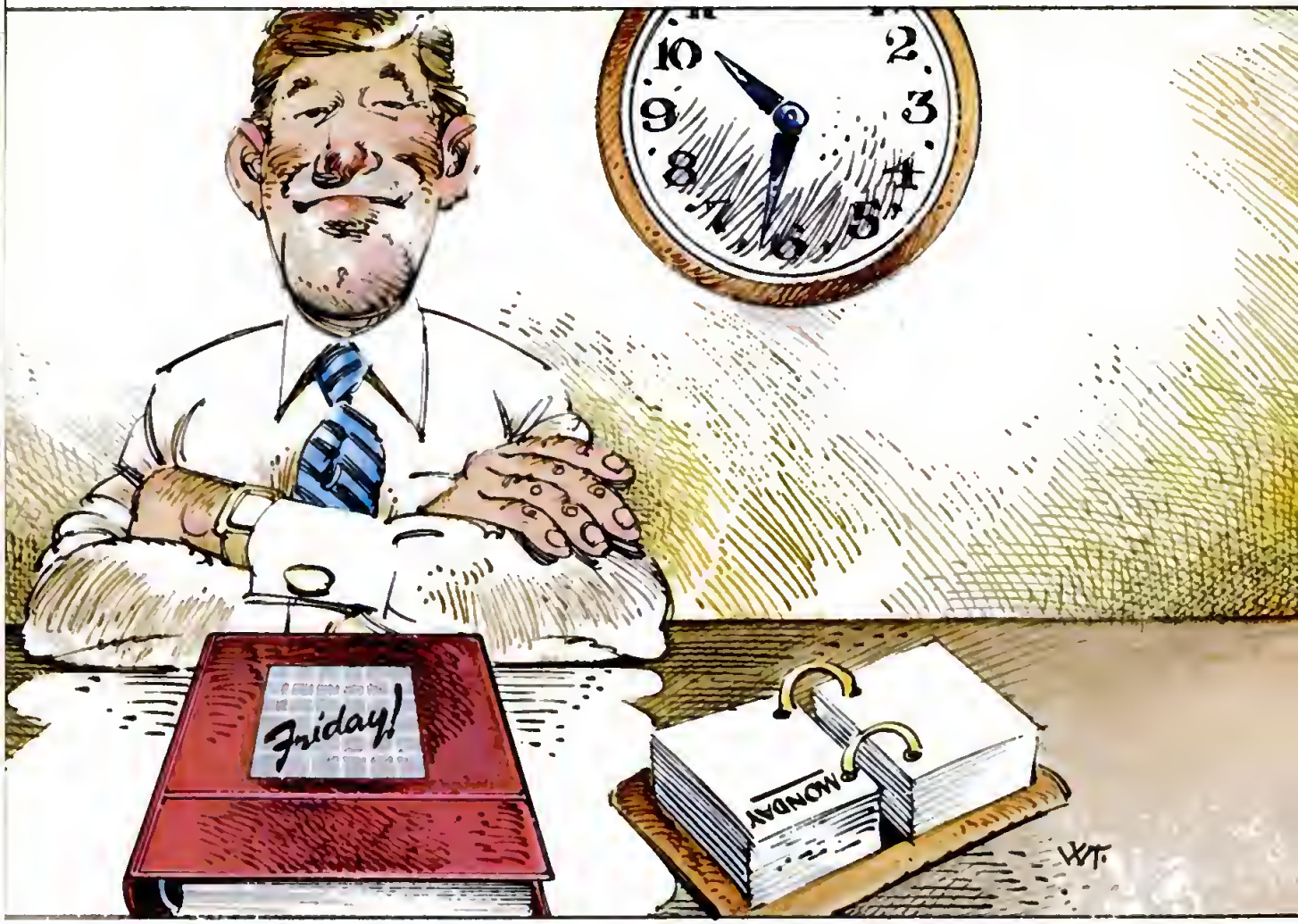
Or a custom report that the old man can take to a Board of Directors' meeting. (Friday! and I whipped one out last week and he said it was the best he'd seen since the company opened its doors.)

Very simply—and with blazing speed—Friday! handles just about everything that needs handling around the office.

It's terrific for inventory and invoices and paychecks and input screens and plain or fancy reports. It works with dBASE II and 1-2-3[1] and Wordstar[2] files.

And wait until you see the way it handles mailing lists and labels—it's worth the $295 price for that alone!

done by Friday!™



Well, with Friday! on board, everything's running so smoothly these days, I now have time to contemplate my next move up the corporate ladder.

If, that is, Dad has cleared off the next rung for me.

For the name and location of the Friday! dealer nearest you, contact Ashton-Tate, 10150 W. Jefferson Blvd., Culver City, CA 90230. (213) 204-5570.

Or better yet, just call today and start getting everything done by Friday!

ASHTON·TATE

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Friday! and dBASE II are trademarks of Ashton-Tate.
1-TM Lotus Corp. 2-TM Micropro. 3-TM Digital Research.
4-TM IBM Corp. 5-TM Microsoft.

CIRCLE 151 ON READER SERVICE CARD

With an AST Research Multifunction Board, you can realize the full potential of your IBM PC or PC-XT without wasting valuable slot space. By combining your memory and input/output requirements on a single card, you can take advantage of more of the capabilities IBM designed into the PC, while leaving space for future enhancements as they are introduced.

AST Research Multifunction Boards can add the following features to your PC:

- **User Memory from 64K to 512K** — When added to your existing system memory, brings your PC up to its maximum of 640K. This enables you to run larger spreadsheets, create larger in-memory databases, or you can use the additional memory along with the supplied AST SuperPak™ software for print spooling or for simulating floppy drives to increase your PC's throughput.

- **Serial Ports** — By connecting a modem to a serial (async) port, your PC can communicate with other computers over telephone lines. By connecting a serial printer, you can obtain high quality print output. Other serial devices such as a plotter or mouse may also be connected to a serial port. The PC allows for the installation of up to two serial ports.

AST

Number One Add-On Products for IBM PC

Number One Add-On Products for IBM PC

Optional features may be added by the user at any time by installing an AST Research Upgrade Package.

All products come with extensive documentation as well as all necessary adapter cables.

	MEMORY	Serial Port 1	Serial Port 2	Clock	Printer Port	Game Port	Bus Extension
SixPakPlus	X	X		X	X	X	
MegaPlus II	X	X	X	X	X	X	X
I/O Plus II		X	X	X	X	X	
ComboPlus	X	X		X	X		
MP Expansion	X						

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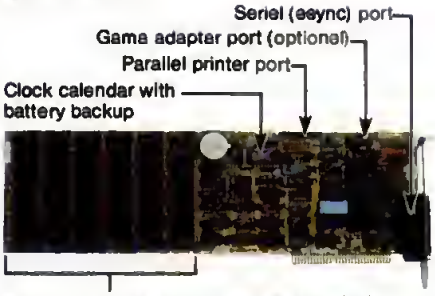
AST Research Micro-to-Mainframe Communications Products:

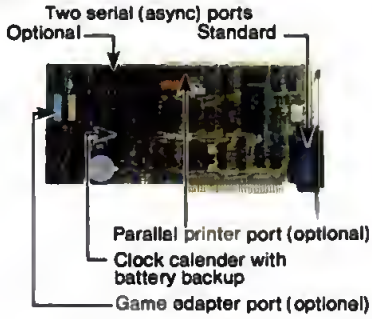
- **AST-SNA** — A family of five products that enable a PC to communicate with a mainframe via the IBM SNA protocol without the use of protocol converters.
- **AST-5251** — An interactive 5251 remote work station emulation package for use with the IBM System 34, 36, or 38.
- **AST-3780** — A hardware/software package which allows an IBM PC to communicate with a mainframe in 2780/3780 bisync protocol.
- **AST-BSC** — A hardware/software package that allows your IBM PC to provide all the features of a 3270 or 2770 terminal in bisync.
- **CC-232** — A programmable card that allows an IBM PC to communicate in async, bisync, SDLC or HDLC protocols.

SixPakPlus™:



64K-384K of parity checked memory. Added to a PC or XT with a fully populated 256K system board, the SixPakPlus can bring the system memory to 640K, the maximum addressable user memory.

I/O Plus II™:



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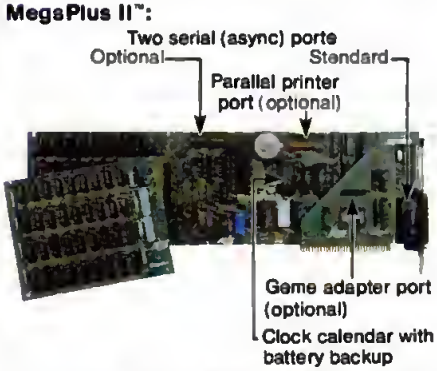

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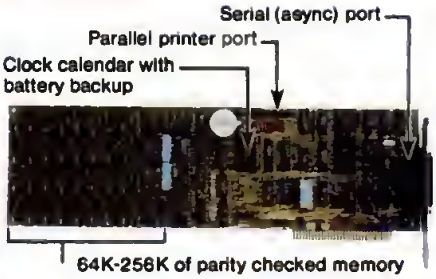

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IBM makes a half-hearted attempt to implement the "volume label" feature in DOS 2.0—a step in the right direction but, as yet, incomplete.

Volume Labels In DOS 2.0

(And More Reasons To Expect DOS 2.1)

One of the intaresting naw features that came with the 2.0 release of DOS is "volume labels" for disks. In this month's column we'll take a look at what these labels are, how DOS works with tham, and what they might do for you.

We've always hean ahle to scrawl any information that wa wantad onto the sticky labal on the outsida of a diskette. That's what's called an external lahel, and it's what people use to halp keep track of their diskettes. DOS, however, can't read our handwriting on the outside of the diskette, and if we want DOS, or any other program, to be ahla to identify our diskattes, than we need to have some kind of internal label that can be read hy the diskatta drive, just like any other part of the magnatically recordad information on tha disk.

Beginning with the 2.0 release, DOS provided a way to give disks internal labels. Curiously anough, this lahel feature was added to DOS in a vary half-haarted way, as wa'll see in a moment, after we take a look at the technical details of how labels are placed on disks.

THE LABEL feature was added to DOS in a very half-hearted way.

As you know, each diskatta and hard disk has a directory to keep track of tha files on tha disk. The directory listing command (DIR) provides a list of the files recorded in a disk's directory, along with some of tha information kept on each file, such as the file's size and the date and time tha file was written. The disk's file directory is just a simpla tahla of information, with one entry for each file on the disk. Each entry records avarything important about the file, such as its nama and whera tha fila is located on the disk.

When it came tima to add voluma lahels to disk, Microsoft—tha folks who prepare DOS for IBM and the rest of us to use—facad a prohlam common to all tachnical designs from computars to telephones: How do you add something new, without disrupting what's old? This is a nightmare that haunts systam designars

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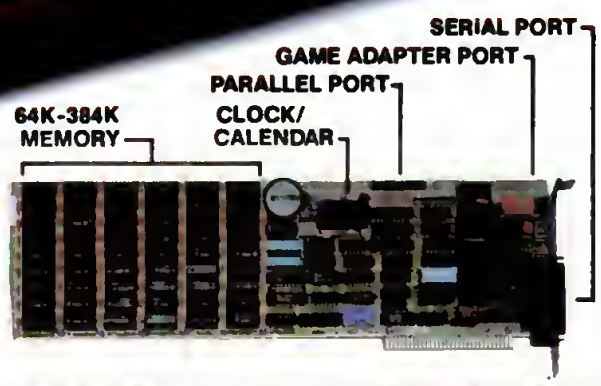

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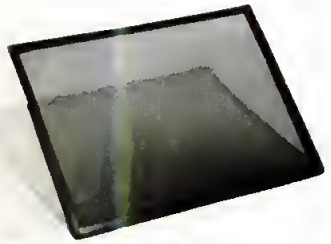

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everywhere; the trick is to integrate the new into the old in a tidy and elegant way. Easy to say but sometimes hard to do. In the case of disk volume labels, it was done very nicely.

Defining Volume Labels

The neat solution for placing volume labels on a disk is to use one of the entries in the file directory so that the volume label is recorded in the same way as any disk file is recorded. A disk's volume label appears in the directory just like any file would with three special differences. The first difference, and the most critical one, is that the label entry is marked as a volume label by one bit in a part of the directory entry known as the "attribute byte." The attribute byte is used to mark any special status of a file. For example, hidden and system files (which you will see reported by the CHKDSK command) are indicated by bits in the attribute byte. In a future column we'll take a closer look at the uses of the attribute byte, but for now all we need to know is that it has an indicator that distinguishes ordinary files from volume labels.

IT SEEMS AS though labels were an idea that IBM and Microsoft wanted to create, but weren't really ready to support.

The second difference between a volume label and any other entry in a disk's directory is that whereas a file contains some data, a label doesn't. So the parts of a directory entry that record the size and location of a file's contents are blank for a volume label. However, the date- and time-stamp part of the directory entry are used for labels so that we know when a volume label was created.

The third difference between volume labels and ordinary directory entries appears in the interpretation of the name. Filenames, as we know, have two parts: the filename proper, which can be up to eight characters long, and the extension to the filename, which can be up to three characters long. When a filename is written, the two parts, (filename and extension) are put together, with a period dividing one part from the other. All told, there can be up to 11 letters in a filename. Since disk volume labels are stored in the same directory table used to hold filenames, volume labels are also limited to 11 characters in length. The difference, though, is that volume labels aren't punctuated into two parts; a label has just one part, which can be as short as one character, or as long as eleven. Since there is only one part to a volume label, a period is not needed.

Limitations

When you start using labels on your disks, you'll quickly discover that DOS 2.0 makes use of the idea of disk labels in a very half-hearted way. It seems as though labels were an idea that IBM and Microsoft wanted to create, but weren't really ready to support. There are many signs of this. For one thing, DOS only allows us to put labels onto disks when we format them. DOS doesn't give us any way to add labels to existing disks, or to change the label on a disk, or to remove a label from a disk that was formatted with one. If you want to make real use of disk labels, you need the flexibility to add, change, and delete labels at will, but DOS doesn't give us the means to do so. I thought that this was intolerable, so one of the very first things I did when I began tinkering with DOS 2.0 was to write a program, called *Label*, which would do these nice things. You'll find *Label* included in the second issue of PC: The Disk Magazine. With a copy of *Label*, you can be in full control of the labels on your diskettes.

IF YOU WANT to make a real use of disk labels, you need the flexibility to add, change, and delete labels at will.

There are more limitations on what DOS 2.0 does with volume labels than I've

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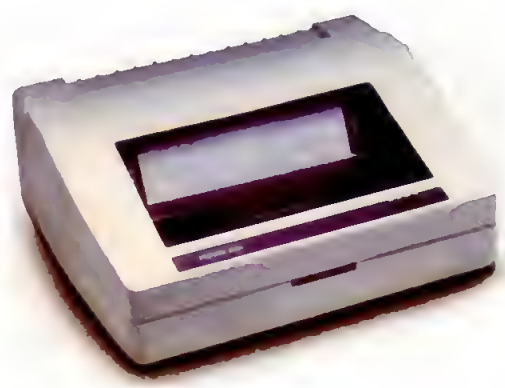

ONE OF THE extra limitations on volume labels is that they can only be placed on 9-sector diskettes.

mentioned so far. As you probably know, DOS 2.0 can create diskettes with 9 sectors per treck, which gives 12 percent more storege space then the 8-sector format usad by DOS 1.1; while DOS 2.0 can work with elther formet. DOS 1.1 can only use 8-sector disks. One of tha extra limitetions on volume labels is that they can only be placed on 9-sactor diskettas. The apparent reeson for this is to avoid confusing DOS 1.1 with e label that it knows nothing about. But the simple fect of the matter is, DOS 1.1 versions are slightly parplexad by diskette volume labels, but the lebels don't do DOS 1.1 any harm. So, as far as I heve been eble to discover, there is no reelly good reeson not to put lebels on 8-sector formatted diskettes, even if they will be used with DOS 1.1. So our *Label* program has bean dasigned to work with either 8- or 9-sector diskettes.

Benefits

The reel question for most of us is, do voluma labels do anything useful? Tha answer is that they are useful, in a quiet sort of wey. There are three benefits to having lebels on our disks; one we can enjoy now, end two thet should ripen in the future. The immediate benefit of volume labels is that they halp us keep track of which diskettes are in our drives. Whenever we give e DOS command, such es DIR, CHKDSK, and TREE, DOS reports the volume lebel on the diskette. This can be extremely conveniant. If we hava givan the diskettes good, maaningful voluma labels, then these frequant reports of the label help us keep track of which diskette is in which driva, thereby preventing us from executing tha right oparation on the wrong diskatte.

The second thing that lebels can do is ellow programs to look at the lebel to see if tha right diskette is mounted. If you have worked with some of the more complicated application software, such as accounting programs, you've seen thet many times thay require switching diskettes around while the program is opereting. With volume labels on the diskettes, the application programs could check that the right diskette is in tha right drive. We probably won't sae much of this being done, but it creetes the potentiel for complex program systems to become more eutometic and more error-resistant.

The third major use for volume labels is to belp keep track of the contents of diskettes. There are librarian programs aveilеble—including one from IBM—that will keep a record of the files on our diskettes, noting which files are on which diskettes, which filas hava back-up copies on mora then one diskette, which versions of files are tha latest, and so forth. Any system like this has to heve a way to refer to the diskettes, and volume lebels are the neturel way to do so. I heve heard, though, that IBM's disketta librarian system isn't compетible with the volume labels used by DOS 2.0. If this is true, it's enother unfortunete example of tha right and left hands not working together.

VOLUME LABELS are useful in a quiet sort of way.

Unfinished DOS 2.0

The more and more closely wa look at DOS 2.0, the more incomplete elements we find in it. Certainly tha incompleta hendling of volume lebels is en example of this. There are many signs that 2.0 is just e rough and transitional version and so it seems likaly to me that we will see e cleaned up varsion, perhaps called DOS 2.1, in the near futura. We can only guess at what IBM and Microsoft have up thair sleeves, but en improved edition of DOS 2.0 saems a likely guess. */PC*

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215-934-6990

CIRCLE 120 ON READER SERVICE CARD

Plain talk about printers...

Dot Matrix Printers

Since an IBM PC can drive almost any parallel printer on the market, software compatability is critical. Remember, too, that no *printer* is 100% compatible with the IBM PC except the PC printer—Epson, Okidata & Mannesmann Tally printers are the next best choices.

EPSON

FX, RX & MX

The **FX-80** features 160 cps, a correspondence font, 10, 12 & 17 cpi, italics, double-strike/width/emphasis, etc., dot graphics, friction/pin feed (the adjustable tractor is optional) & a 2K buffer. The 256 programmable characters use the 2K buffer space. The **FX-100** is the 136 column version & includes an adjustable tractor.

The **RX Series** replaces the MX & offers 100 cps print speeds, but nothing more remarkable.

RX-80	$398.88
MX-80 F/T	$469.88
MX-100	$664.88
FX-80	$564.88
FX-80 Tractor	$39.88
FX-100	$799.88

C. ITOH

Prowriter

C. Itoh's venerable **Prowriter** has speed (120 cps), a buffer (1.5K), 10, 12, & 16 cpi (plus a proportional font with correspondance quality) and dot graphics (160x144 dpi). One of our biggest sellers. The **Prowriter 2** has the same specs, but in a 136 column format.

Prowriter	$399.88
Prowriter 2	$718.88

STAR MICRONICS

Gemini 10X/15

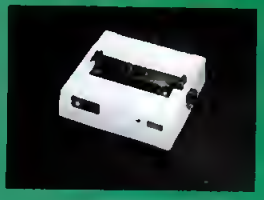
The **Gemini 10X** features 120 cps, 10, 12, 17 cpi, italics, a correspondance font, 120 x 144 dpi graphics matrix & a 1K buffer. **Gemini 10X**'s comes with friction/tractor feed & use plain spool ribbons. The **Gemini 15** is the 132 column version, & it has a proportional font.

Star's **Delta 10** features both parallel & serial interfaces, 180 cps print speed, an 8K buffer, plus most of the Gemini 10X fonts. That's all we can tell you now...more on it soon.

Gemini 10X	$329.88
Gemini 15	$499.88
Delta 10	$CALL

OKIDATA

Microline Series



The Microline 82 (80 col) & **83** (132 col) are ideal for word processing. They offer a 160 cps draft mode, a 40 cps correspondance mode, 10, 12 & 17 cpi (w/double-width), pin/friction feed (tractor is optional on the **92**) & dot-addressable graphics (120 x 1444). Centronics parallel interface is standard; the serial (RS-232C) interface is optional.

A new PROM called **PC Plug-n-Play** turns a **92** or a **93** into an IBM printer, with full screen dump capabilities. You will sacrafice a few features (like 12 cpi) but the PROMs are worth it if total compatibility is your goal.

The **Microline 92A** (80 col) & **93A** (132 col) are data crunchers, period. They print 120 cps, at 10 & 16 cpi (5/8 double-width). Dot-addressable graphics are optional.

The **Microline 84** (132 col) is the Step 2 version, featuring 200 cps at 10, 12, & 17 cpi (w/double-width), all with a correspondance mode & dot addressable graphics. Parallel or serial (RS-232C) interfaces available.

Microline 82A	$419.88
82A/92 Tractor	$99.88
Roll Paper Holder	$49.88
Microline 83A	$678.88
82A/83A Okigraph 1 Graphics ROM	$49.88
Microline 92	$634.88
Microline 93	$884.88
92/93 IBM-PC Plug-n-Play Graphics ROM	$48.88
92/93 RS-232C Interface	$99.88
Microline 84	$1024.88
w/RS-232C Interface	$1139.88

MANNESMANN TALLY

MT-160 L

The **MT-160 L** is the newest of the correspondence quality printers. It has speed (160 cps), 6 fonts, parallel & serial interfaces, friction/tractor feed & menu-driven installation for easy set-up from the control panel—no more digging around for the dip switches. It's remarkably compact & efficient, & the print quality is superior. This year's sleeper. The **MT-160 L** is the 136 column version. A new, low cost draft printer the **Sprite**, is also available.

MT-160 L	$669.88
MT-160 L	$CALL
MT-Sprite	$CALL

We sell other dot matrix printers including the **Anadex WP-6000, DP-9501, DP-9620 & DP-9620 & IDS's Prism 80, Prism 132 & MicroPrism & the Inforunner Ritemen**. You can call **(603) 881-8895** for technical details. For prices, or to order, call **(800) 343-0728**.

Letter-Quality Printers

Letter-quality printers are business machines, & very high-ticket ones at that. Most individuals should buy a dot matrix first, adding letter-quality when it's needed.

Smith-Corona Memory Correct III Messenger

Here's the printer you've been waiting for. The Smith-Corona **Memory Correct III Messenger** is ideal for the home or small office. It combines the features of an electric typewriter ***and*** a letter-quality printer. And it's designed to handle both jobs with ease.

Features 12 cps, 3 pitches (10, 12 & 15), variable line spacing, 10.5" writing line, backspacing & auto-correction. Comes complete with parallel/serial interface.

Memory Correct III Messenger **$629.88**

C. ITOH

Starwriter

The C. Itoh **Starwriter** offers top speed at a good price. **Starwriter** uses Diablo code wheels & ribbons, has a 40 cps print speed, 1/48" line space, 1/120" horizontal spacing—ideal for proportional modes. (For real speed freaks, there's the **Printmaster**, at 55 cps. Same specs as above.)

Starwriter Parallel	$1219.88
Printmaster Parallel	$1979.88

SILVER REED

EXP-550

Why buy a Transtar when you can buy from the guys who make them? The Silver Reed **EXP-550** is a 16 cps, 132 column letter-quality printer with *true* Diablo 1610/1620 emulation, making it compatible with most word processing software. It's ideal for medium duty office work. Add a buffer & you'll have a versatile printing system. If speed's not a factor, the **EXP-500** at 12 cps (80 col) is available as well.

EXP-550 (Parallel)	$719.88
EXP-500 (Parallel)	$499.88

SMITH-CORONA

TP-1/TP-2

A natural evolution, the **TP-2** offers a dual interface, form/line feed control, ASCII printwheels, but it retains its fixed pitch & uni-directional paper feed that the **TP-1** made famous. Theses are light-duty machines for the home or a small office. Both use the same tractor feed. (Specify 10 or 12 cpi when you order.)

TP-1	$CALL
TP-2	$CALL
TP Tractor	$CALL

NEC

Spinwriters

2010/2030	$999.88
2050	$1149.88
3510/3530	$1729.88
3550	$1999.88
7710/7730	$2399.88

We sell a variety of other letter-quality printers, including the **Comrex ComRiter, Diablo 620 & 630** the **Qume Sprint 11+**, plus many others. Call **(603) 881-9999** for technical details. For prices, or to order, call **(800) 343-0728**.

USI

Pi Monitors

Our love affair with the **Pi 2** amber monitor continues. The consensus is yes amber is easier on the eyes in the long run. So is the **Pi-3**'s 20MHz bandwidth and sharp, clear phosphor. Comes in 9 or 12" & in green.

Pi-3 (12" amber)	**$169.99**
Pi-4 (9" amber)	**$169.88**

AMDEK

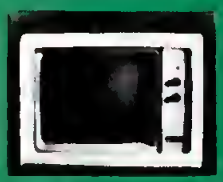
300 (12" green)	**$149.88**
300A (12" amber)	**$159.88**
310 (12" green)	**$199.88**
310A (12" amber)	**$199.99**
Color II (RGB)	**$649.88**
Color III (RGB)	**$379.88**

NEC

JB1205M (12" amber)	**$178.88**
JC1203 (12" RGB)	**$638.88**

QUADRAM

QuadChrome



The **QuadChrome** is one of the highest resolution RGBs available: 16 colors (using NEC's tube), 690 dots by 240 lines (480 non-interlaced), 15MHz bandwidth & more. The case is identical to IBM's, & it comes with its own cable.

PGS HX-12 **$929.88**

PRINCETON GRAPHICS

HX-12

The **HX-12** has the same specs as the QuadChrome. Same price too.

HX-12 **$529.99**

Modems

Internal? External? 300 baud? Or 1200? 1200 baud makes sense if you're on-line during the day. If you're on-line late at night, 300 baud may be all you need. As always, research this stuff *before* you buy.

DC HAYES

Smartmodems

The **Smartmodems** are originate/answer, auto dial/answer, full/half duplex modems. There are two external modems (300 & 300/1200 baud) & the **1200B** (300/1200 internal for the PC) that includes the Soltcom II soft vara. Modular phone cable & power supply included. (RS-232C cable is optional.)

"Stack" Smartmodems	
300 baud	**$219.88**
300/1200 baud	**$629.88**
Internal Smartmodem	
1200B w/Soltcom II	**$499.88**

US Robotics Password
$379.88 UPS DELIVERED

The **Password** is a direct connect originate/answer type modem with 0-300 & 1200 baud capability (Bell 212A compatible). Features include auto dial/answer, auto mode/speed select, full/half duplex (local echo), DTR override, RS-232C pins 2 & 3 reversible & audio phone line monitor. Comes with an RS-232C cable, power supply & modular telephone cable.

NOVATION

Smartcat (300 baud)	**$199.88**
Smartcat (1200 baud)	**$499.88**

STANDARD MICROSYSTEMS

M-Term

M-Term is both communications software & a terminal package. Certified 2400 baud operation, terminal/command mode, repeat DOS command & direct file transfer. It supports the auto dial/answer features of the USR **Password**, the DC Hayes **Smartmodems** & Novation's **SmartCat**.

M-Term **$79.99**

Peripherals

There's also a lot of mis-information regarding peripheral boards for the IBM PC. Fact is, most of them work on the PC out of the box—you don't need to upgrade the motherboard. ***Do your research!*** It'll pay off for you.

AST RESEARCH

MegaPlus

The **MegaPlus** crams two RS-232C ports, a parallel port, a clock & up to 256K RAM into only one slot. Comes with SuperDrive/Spooler software. You can add memory in 64K units up to 256K.

The **MegaPak** is a 256K piggyback card that attaches to the MegaPlus & gives you up to 512K on one board.

64K MegaPlus	**$269.88**
256K MegaPlus	**$509.88**
256K MegaPak	**$329.88**

AST RESEARCH

Sixpak

A nifty idea: the **Sixpak** has 6 banks of 64K each for a board total of 384K. Add that to your 256K motherboard & you've got 640K, the maximum PC memory workspace. **Sixpak** has the usual RS-232C port, parallel port, clock & SuperDrive/Spooler software. An optional game port is also available.

64K Sixpak	**$298.88**
Game Port	**$49.99**

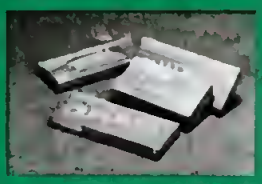
AST I/O+

The **I/O+** has a parallel port, a RS-232C ports, a game port & a clock, but no memory.

I/O+ **$199.88**

QUADRAM

Quadboards



The original is still the greatest! The **Quadboard** has an RS-232C port, a parallel port, a clock & memory up to 256K (you can also get your **Quadboard** "naked," with no memory installed). QuadSpool/Drive software is included with every **Quadboard**, along with a one-year warranty.

Quadboard 0K	**$219.88**
Quadboard 64K	**$278.88**
Quadboard 256K	**$429.88**

QUAD 512+

Quad 512+s have a single RS-232C port on them, and sockets for up to 512K RAM. QuadSpool/Drive software is included.

Quad 512+ (64K)	**$229.88**
Quad 512+ (256K)	**$399.88**
Quad 512+ (512K)	**$999.88**

Single Function Cards are single-duty cards only, as described below. No software is included.

Parallel Card w/cable	**$89.88**
RS-232C Card	**$99.88**
Clock/Calender Card	**$88.88**

QUADRAM

QuadLink

This is a real breakthrough! **QuadLink** lets you run Apple II/II+ software on the PC. It's like an Apple computer on one board, with 64K. Uses all PC printer/video ports. No disk conversion or reformatting required! Takes up only one slot.

QuadLink **$549.88**

Disk Drives

Internal hard disk drives have one weakness: they can bring your whole system down if you have a problem. We suggest keeping the PC drives A & B intact, and using an external unit that can be detached should it need service.

QUALITY COMPUTER SERVICES

Hard Disk

We took our QuCeS **Hard Disk** out of its box, plugged it in, turned on the power & never tussed with it again. These units are rugged, reliable & warrantied for a full year. They're easily interfaced to the PC.

12Mb Hard Disk	**$2099.88**
20Mb Hard Disk	**$2398.88**
40Mb Hard Disk	**$2829.88**

BIG BLUE

Big Blue runs CP/M 80 software. Parallel port, RS-232C port, clock, memory, hard disk interface & Z80 processor on board.

Big Blue **$479.88**

IBM PC COMPATIBLE

Disk Drives

Tandon's **TM-100-2** at 320K storage, is still holding its own. We've used them exclusively for a year now and will continue to do so.

Single-sided	**$229.88**
Double-sided	**$279.88**

MAYNARD ELECTRONICS

Disk Controller

Perfect for bare-bones configurations. Handles two internals (A & B), plus two externals. Comes plain, with one parallel port or with one RS-232C port. (This is **not** the modular package.)

MFD Standard	**$189.88**
MFD w/Parallel	**$219.99**
MFD w/RS-232C	**$269.88**

Information/Orders:
(603) 881-9855
Prices/Orders Only:
(800) 343-0726

No Hidden Charges:

We pay UPS ground shipping on all our orders, and we never charge extra for credit cards. We accept CODs & add a $10 fee per order. We have a $50 minimum order. Personal checks are cleared in 3 weeks.

All our equipment is shipped with full manufacturer's warranty. We sell only what we are authorized to sell to insure full warranty support, & we're authorized for warranty work on a number of printers. We also offer extended warranty plans for most printers.

Sorry, we cannot accept open POs or extend credit/terms at these prices. APO and foreign orders are not accepted. We prepared this ad in August & prices do change, so call to verify them.

Our **Computer Showroom** located in Amherst, New Hampshire, is now open.

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THE BOTTOM LINE

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CIRCLE 152 ON READER SERVICE CARD

Low Prices!

Expansion Boards

AST RESEARCH
All AST RESEARCH boards include SuperDrive and SuperSpool software.

MEGAPLUS II — Expands to 512K with 256 MEGAPAK or to 384K with 128K MEGAPAK. Includes CLOCK/CAL & 1 SERIAL PORT.
W/64K 265.00
W/256K 430.00
256K MEGAPAK 275.00
128K MEGAPAK 199.00
OPTIONAL 2nd SERIAL PORT 40.00
OPTIONAL PARALLEL PORT 40.00
OPTIONAL GAME PORT 40.00

COMBOPLUS expands to 256K, includes CLOCK, PARALLEL & SERIAL ports.
W/64K 265.00
W/256K 430.00

I/O PLUS II — I/O only (no memory). Includes CLOCK & 1 SERIAL port.
I/O PLUS II 120.00
OPTIONAL 2nd SERIAL PORT 40.00
OPTIONAL PARALLEL PORT 40.00
OPTIONAL GAME PORT 40.00

SIX PACK PLUS — expands to 384K, includes CLOCK, PARALLEL & 1 SERIAL port.
W/64K 265.00
W/384K 549.00
OPTIONAL GAME PORT 40.00

QUADRAM
All QUADRAM boards include QUADMASTER software.

QUADBOARD I — expands to 256K & includes 1 SERIAL port, 1 PARALLEL port & CLOCK/CALENDAR.
QUADBOARD I W/64K 275.00
QUADBOARD I W/256K 430.00

QUADBOARD II — expands to 256K & includes 2 SERIAL ports & CLOCK/CAL.
QUADBOARD II W/64K 275.00
QUADBOARD II W/256K 430.00

Disk Drives

All floppy disk drives are double sided, double densily and include complete instalialion instructions and all hardware. Floppy drives from Micro Match include our exclusive 90 day replacement warranty. Call for details.

CDC 9409 ..... 259.00
TANDON TM 100-2 ..... 249.00
SHUGART (half-height, 1 year) 239.00

FLOPPY DISKETTES
DYSAN 2 sided, double density. Box of 10 ..... 43.00

QUADBOARD 512+ expands to 512K & includes 1 SERIAL port.
QUADBOARD 512+ W/64K 235.00
QUADBOARD 512+ W/512K 595.00

SEATTLE COMPUTER
All SEATTLE COMPUTER RAM + boards include FLASH DISK software.

RAM + memory & 1 serial port
RAM + W/64K 165.00
RAM + W/256K 325.00

RAM +3 memory, 1 serial port, 1 parallel port & clock calendar
RAM +3 W/64K 255.00
RAM +3 W/256K 395.00

TALL TREE SYSTEMS
All TALL TREE SYSTEMS boards include JFORMAT & JETDRIVE.

JRAM — memory only, expands to 512K
JRAM 0K 249.00
JRAM 512K 665.00

Displays

AMBER SCREEN DISPLAYS
AMDEK 300A for color card 155.00
AMDEK 310A for mono card 170.00

COLOR DISPLAYS
AMDEK COLOR II hi res RGB 435.00
AMDEK COLOR IV hi res RGB 1125.00
ELECTROHOME 1302-2 hi res RGB 575.00
NEC JC12030 hi res RGB 645.00

DISPLAY ADAPTER BOARDS
HERCULES high resolution monochrome graphics adapter card. 375.00
AMDEK MAI VIDED INTERFACE. Color graphics adapter card. 655.00

Printers

EPSON PRINTERS
FX 80 parallel 542.00
MX 100 parallel 610.00
FX 100 parallel 699.00

OKIDATA PRINTERS
ML 80 parallel 330.00
ML 92 parallel 515.00
ML 93 parallel 619.00
2350 serial 2179.00
2410 serial 2460.00

NEC PRINTERS
3510 Spinwriter 1470.00
3525 Spinwriter 2120.00
3550 Spinwriter 1880.00

Software

ASHTON-TATE
dBASEII $425.00
FINANCIAL PLANNER 455.00
BOTTOM LINE STRATEGIST 265.00
FRIDAY 179.00

CONDOR
20-3 DATA BASE MGR 415.00

FOX & GELLER
QUICK CODE 210.00
DGRAPH 210.00

LIFETREE
VOLKSWRITER 1.2 ..... 135.00
VOLKSWRITER INTERNATIONAL 169.00

LOTUS
123 (VERSION 1A) 335.00

HAYES
SMARTCOMII 85.00

PEACHTREE
PEACHPACK 4 GL/AR/AP 239.00
PEACHTEXT 5000 ..... 239.00

SORCIM
SUPER CALC II 162.00
SUPER WRITER 162.00
SUPER SPELLGUARD 125.00

TALL TREE SYSTEMS
JFORMAT 39.95
JFORMAT 2.0 ..... 35.00

Modems

HAYES MODEMS
SMARTMODEM 300 ..... 209.00
SMARTMODEM 1200 ..... 499.00
SMARTMODEM 1200B 450.00
300 PACKAGE — Modem, Cable & SmartCom II software 299.00
1200 PACKAGE — Modem, Cable & SmartCom II software 579.00

Ram Chips

RAM CHIPS — All RAM chips from Micro Match are the highest quality components available anywhere. Every RAM chip comes with the Micro Match 90 day exchange warranty. Call for details.

64K, set of 9 (200 nsec) 59.00

To Order by phone call (213) 352-3253. Send Check or Money Order. Master Card/Visa accepted (include expiration date & signature). Add $3.50 for shipping, handling & insurance (2 day Airmail $8.00). All orders shipped UPS unless otherwise specified (Continental US only). Other shipping methods or destinations, call for best way & price. California residents add 6½% sales tax. All items subject to availability. Prices subject to change without notice.

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Your family and CAI's growing family of animated, full-color programs have a lot to share —beginning with a willingness to reach beyond the ordinary to achieve the best.

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You may meet a princess, a juggler or a dragon in *Wizard of Words.*™ You may appear as a guest on TV in *Master Match,*™ *The Game Show*™ or *Tic Tac Show.*™ Or, you may extend these programs still further with our *LearningWare*™ diskettes, offering hundreds of questions matched to the teaching strategies in the games. In every case, CAI puts a world of imagination and learning at your fingertips. And puts you and your child in control.

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Key features place CAI thinking tools in a class by themselves: Each program comes with its own *library of subjects.* But that's just the start. Our unique *authoring system* let's you or your child create your own lessons on any topic, tailoring the program to your family's needs —and no computer knowledge is required. Add the fact that we've kept the vital ingredient –*FUN*– in learning, and our *proven success* is no surprise. Over 2,000 school districts now use CAI programs to teach essential vocabulary and logic skills in a variety of subject areas.

CAI supports its products —and you —with an unconditional guarantee and a free backup disk. And provides compatibility with the most popular computers: Apple,® IBM® (and soon Commodore™).

Wise Choice

CAI is a group of experienced educators and programmers who believe that success begins with opportunities you create at home. Ask to see a demonstration of CAI programs at your local computer store, and see for yourself just how rewarding a good education can be.

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CIRCLE 114 ON READER SERVICE CARD

Let's Talk GrafTalk™

GrafTalk is business graphics software that works as hard for your business as you do.

You can use GrafTalk the way you'd like
GrafTalk is flexible in accepting commands. You can type English-language commands interactively, run commands from disk files, or use GrafTalk's menus if you prefer.

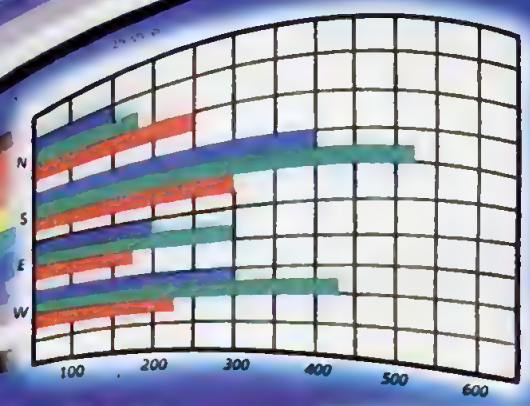
GrafTalk has all the graphics features you need
Choose from stacked, percentage, clustered, or floating bars; exploded pies, line plots, scatter diagrams and combinations plots. And adjust their style to fit your needs.

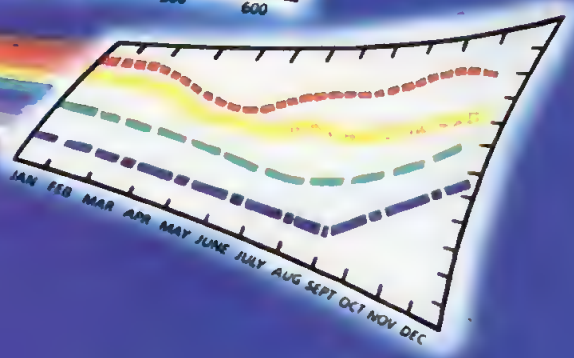
GrafTalk has lots of extras
These include a built-in text editor, a mini-spread-sheet, a feature for creating your own menus, the ability to save and edit your graphs and the capacity to interface with many other programs.

GrafTalk has good, clear documentation
With our color tutorial and full Reference Manual, you can begin making useful graphs right away.

Chances are it works with the hardware you want
GrafTalk runs on CP/M systems, the IBM-PC and other 16 bit systems and with so many screens, plotters and printers that we don't have room to list them all.

Call or write to put GrafTalk to work for you.





GrafTalk is a trademark of Redding Group Inc. CP/M is a registered trademark of Digital Research.

REDDING GROUP

609 Main Street, Ridgefield, CT 06877 Telex 643351
2730 High Ridge Rd, Stamford, CT 06903 203/329-8874

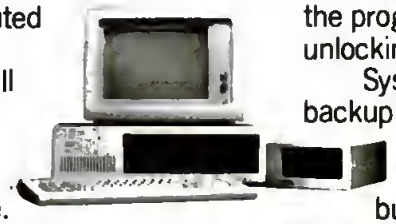
CIRCLE 363 ON READER SERVICE CARD

If you've invested in the IBM PC-XT or an IBM expansion chassis, chances are you're doing important things. Office work. Lots of writing. Managing a portfolio.

Nice going.

Now: May we suggest that you think ahead to the unthinkable: total wipe-out. Your hard disk may never crash and destroy all your files. But it can.

That's why we invented The Sysgen Image.



It lets you back up all your data—your entire hard disk—in about five minutes a day. On a handy little tape cassette. It's insurance against the unlikely event that your hard disk will lose what you've stored on it.

Just stop and ponder a moment about what would happen to your operation if you somehow lost all the data, letters, invoices, and phone numbers on your XT's hard disk.

At $995, we think you'll agree that the Sysgen Image is very inexpensive insurance.

Stop by any smart IBM PC dealer for a demo. Bring this ad; if he hasn't got a Sysgen Image in stock yet, have him call us.

Included with your Sysgen Image is a free data cassette loaded with industry-accepted applications software. It has been protected by Softlink's™ SoftLok™ encryption. If you decide you want to buy any of the programs you preview, you can get the unlocking code from your dealer.

Sysgen: the company that provides backup for your IBM PC, with or without hard disk. (Our Sysgen II 10- or 20-Mbyte hard disk systems, with built-in streaming tape backup, start at $2995.) 47853 Warm Springs Blvd., Fremont, CA 94539. Telex: 4990843. Phone 800-538-8157, Ext. 970. In California, call 800-672-3470, Ext. 970.

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CIRCLE 472 ON READER SERVICE CARD

THE BEST INSURANCE FOR YOUR $4995 IBM PC-XT: A $995 SYSGEN IMAGE.

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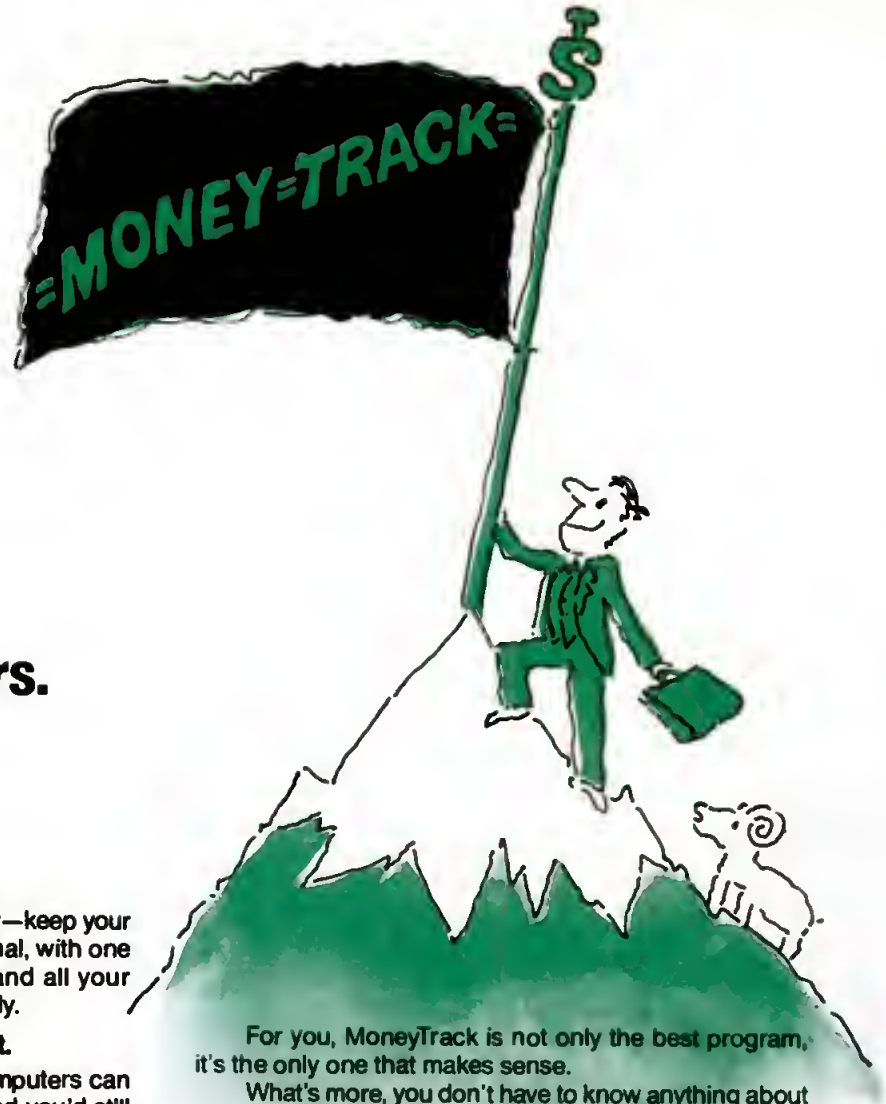

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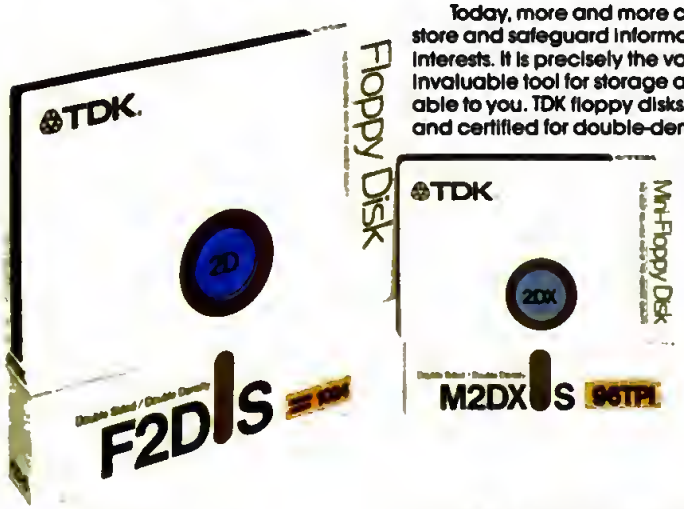

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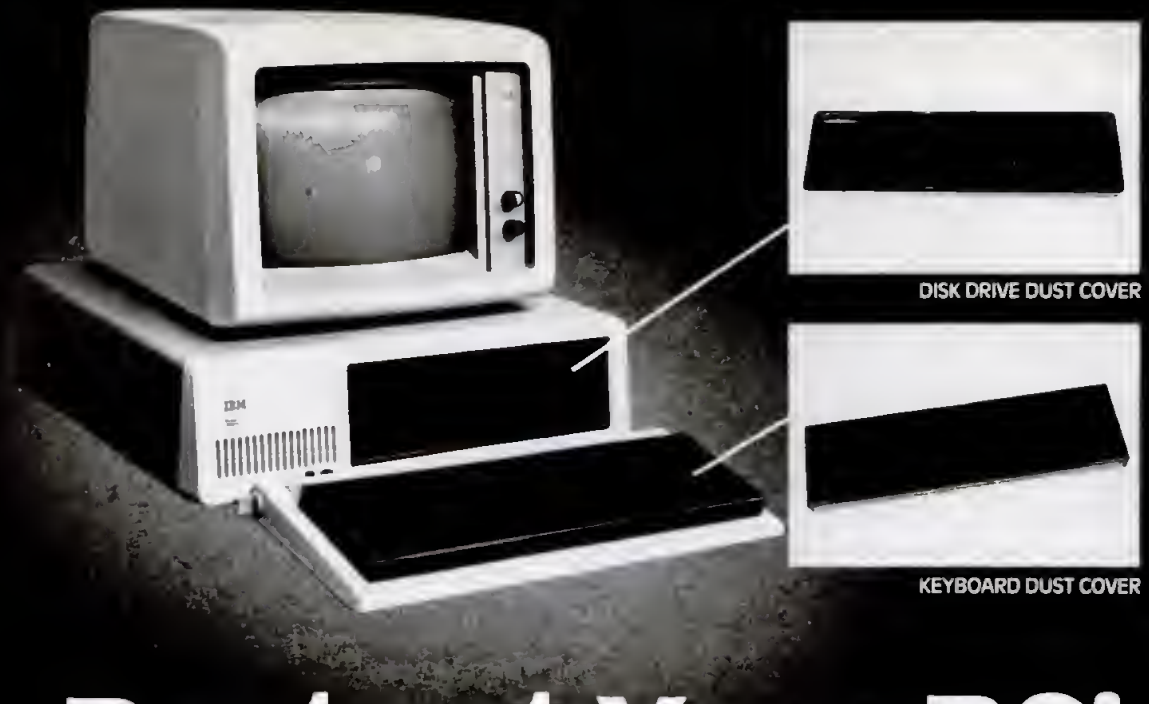

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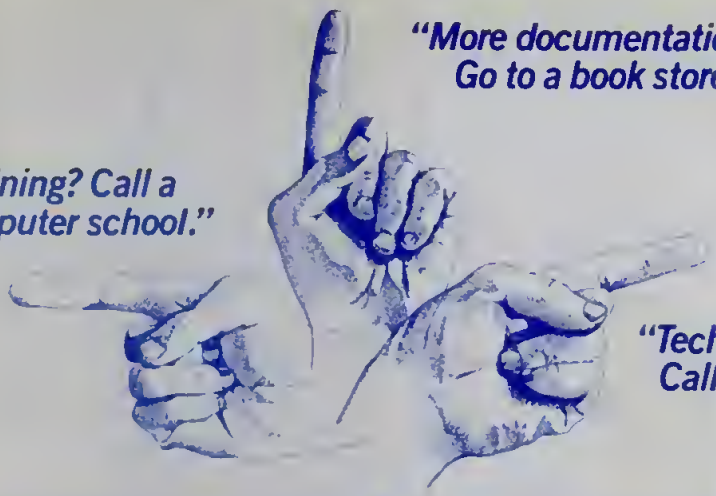

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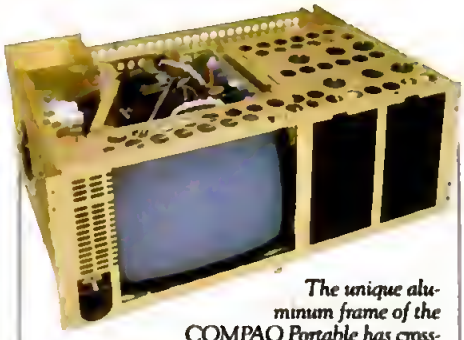
With all the clamor about personal computers, a fundamental fact is often overlooked: some simply *work* better than others.

Consider the COMPAQ Portable.

A computer will make you more productive. A computer will make you more efficient. You hear it everywhere. But you don't hear about which computer actually *works* best.

A computer isn't magic. It's a tool. And just like other tools, some computers work better than others.

The COMPAQ™ Portable is a combination of 20th-century electronics and 19th-century pragmatism. It simply does personal computing better. Here's why.



The unique aluminum frame of the COMPAQ Portable has cross-members that strengthen it front-to-back, side-to-side, and top-to-bottom. It's a design practice commonly used in race cars.

Works in more places

You don't do all your thinking in one place. Why have a computer that stays in one place?

The COMPAQ Portable has all the capabilities of a large desktop computer. But now those capabilities can go where you go.

You can move it from office to office to share its resources. You can move it into the conference room to answer questions when and where they come up.

With the COMPAQ Portable, you can be as productive in your hotel room or your lake house as in your own office. It's a reliable companion on a business trip. It's a powerful sales aid in your customer's office.

What's more productive than a computer? A computer that works for you in more places.

Works with the greatest number of programs

The most important consideration when you choose a computer is "what programs will it run?" And that's one more reason for choosing the COMPAQ Portable.

The COMPAQ Portable runs more programs than any other portable. In fact, it runs more than most non-portables. That's because it runs all the popular programs written for the IBM® Personal Computer. There are hundreds of them. They are available in computer stores all over the country, and they run without any modification, right off the shelf.

Imagine the power of a *portable* word processor. There are dozens of different word processing programs available for the COMPAQ Portable.

Planning, problem-solving, and "what-ifs" are a cinch with a variety of popular electronic spreadsheet programs. The COMPAQ Portable runs them all.

There are accounting programs for anything from computerizing your family budget to full-scale professional management of payables, receivables, inventory, and payroll for your company.

There are programs for making charts and programs for communicating with other computers. Or if you want something really specialized, there are even program languages for writing your *own* programs.

So, you get portability and you don't give up problem-solving power. The combination adds up to the most useful personal computer on the market today.

The COMPAQ Portable was designed to fit under a standard airline seat so you can take it on business trips.

Works better because it's easy to read

The display screen of the COMPAQ Portable measures nine inches diagonally. It shows a full "page width" of 80 characters on a line so tasks like word processing are easier. And those characters are big enough to read even if you're leaning back in your chair.

The display shows both high-resolution graphics and easy-to-read, upper- and lowercase characters. One screen for all the information. With some personal computers, including the IBM, you can have either the graphics or the legible characters, but you can't have both unless you buy two different displays.

There are hundreds of useful programs for the COMPAQ Portable because it runs all the popular programs written for the IBM.

Incidentally, computer prices are often quoted without a display. The display of the COMPAQ Portable is built in, of course.

Add-on options make it work the way you work

Inside the COMPAQ Portable are three open slots. Electronic devices called expansion boards fit those slots and give the COMPAQ Portable new powers.

Just like the programs, expansion boards designed for the IBM work with the COMPAQ Portable, so there are dozens available right now. With them, you can make your personal computer more personal.

Want to check a stock price? Or look up something in The New York Times Information Service? One expansion board enables the COMPAQ Portable to handle those communications over ordinary phone lines.

Want to use your company's central computer files while you're on a trip? There are boards that allow the COMPAQ Portable to communicate with a variety of large mainframe computers.

Other boards let you hook up controllers for computer games or increase memory capacity. Still others let you connect personal computers in a network so several people in your office can share the same information.

Inside the COMPAQ Portable are three slots for optional electronics that can add new capabilities. Most portables have none.

Works better because it's tough enough for the road

Portable doesn't just mean smaller. Portable means tough, too.

The COMPAQ Portable was built to withstand the hard knocks of constant travel. An aluminum frame within the case completely surrounds the computer's working components. Each disk drive is mounted in rubber shock absorbers instead of being bolted directly to the frame.

To test internal components, the COMPAQ Portable was subjected to impacts of 40 G's *while running a program*. After impacts on each side, there was no internal damage and the program was still running. Without error.

Computers are for getting rid of worries, not giving you new ones.

Designed to help you work better, too

The COMPAQ Portable was designed to *feel* good.

Specifications

Software
- ☐ Runs all the popular programs written for the IBM PC

Memory
- ☐ 128K bytes RAM
- ☐ Expandable to 640K bytes

Storage
- ☐ One 320K-byte minifloppy disk drive, second drive optional

Display
- ☐ 9-inch (diagonal) monochrome screen
- ☐ 25 lines by 80 characters
- ☐ Upper- and lowercase, high-resolution text characters
- ☐ High-resolution graphics

Expansion board slots
- ☐ Three IBM PC-compatible slots

Interfaces
- ☐ Parallel printer interface
- ☐ RGB color monitor interface
- ☐ Composite video monitor interface
- ☐ TV RF modulator interface
- ☐ Communications interface optional

Physical specifications
- ☐ Totally self-contained and portable
- ☐ 20"W × 8½"H × 16"D

The keyboard is detached so it can fit into your most comfortable working position.

The keyboard cable remains connected at all times. So you don't have to unpack it and hook it up every time you use your computer.

Because the display is built in, the COMPAQ Portable makes a neat, small package on your desk, instead of a big obstacle you have to talk around. The built-in display also avoids the usual cable clutter because there's no need for separate cables for the display.

The COMPAQ Portable even has an electronically synthesized sound to create the familiar keyclick of a typewriter. With a simple keyboard command you can adjust the volume to suit the level of background noise in your office.

The added usefulness is free

The COMPAQ Portable can do what desktop computers do and do it in more places. But it doesn't cost any more than an ordinary desktop.

In fact, it costs hundreds less than a comparably equipped IBM or Apple® III. The COMPAQ Portable comes standard with one disk drive and 128K bytes of memory, both of which are usually extra-cost options. A second disk drive and additional memory are available to make your COMPAQ Portable even more powerful.

The bottom line is this—you just can't buy a more practical, useful, productive computer. Before you decide on a computer, you owe it to yourself to compare the COMPAQ Portable.

For the location of the Authorized Dealer nearest you, call 1-800-231-9966.

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COMPAQ™

The most computer you can carry

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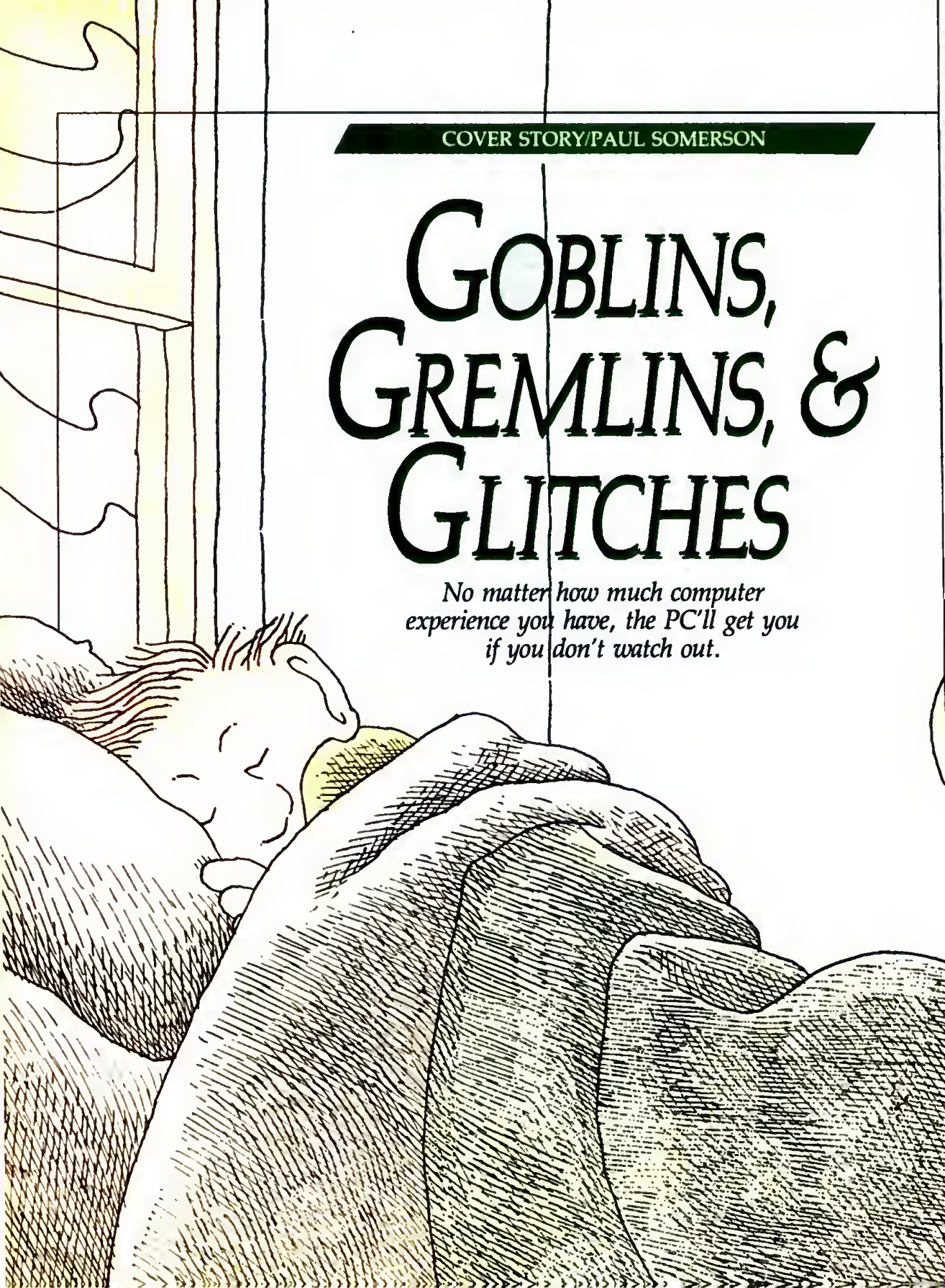
GOBLINS, GREMLINS, & GLITCHES

No matter how much computer experience you have, the PC'll get you if you don't watch out.



Graham Wilson

Funny, isn't it. You get up one perfect spring morning and the air is crisp and clear, hummingbirds are bombinating in the breeze, two bright butterflies flirt past glistening with dew, a bough thick with perfumed blossoms droops against your cheek, and Julie Andrews is on a hilltop in the background wrapped in a dirndl and singing her heart out.

Bubbling with enthusiasm, you roll up your sleeves and snap on your PC to get some real work done. Along about half a disk later you notice a faint odor of toasting plastic. Nothing to worry about, right? The citizens of Pompeii and Herculaneum probably shrugged it off too, when they caught the first slight whiff of sulphur hissing down the Vesuvian slopes.

A microcomputer can perform genuine word processing and number juggling mirecles, but when you're frantically trying to finish a critical report or that year-end financial modeling project and black oily smoke belches out of your disk drives, it can really ruin your day.

To hear the litany of user horror stories, you'd think the three initials stamped on the front of the PC system unit stood for "Invented By Murphy." There are definitely times when his law, rather then Ohm's, dictates how your bits are bounced around.

It's downright eerie how you can be lavishing praise on your system one minute and wanting to put your foot through the screen the next. You watch your word processor flash brilliantly through a series of nimble paragraph relocations and then for no apparent reason sputter and die, taking your unsaved file with it. Was it the software's buggy block move or your own blockheaded move? Or maybe it was gremlins in your ROM; after all, why do you think they call the PC's internal number system "hex?"

A Fine Mess

Someday computers will be foolproof. But by then we'll all be dust settling onto some future user's hyperspace drive. Laurel and Hardy would have had a field day with today's systems. It's pretty easy to visualize the boys behind a mountain of smoking, broken computer rubble while Stan screws up his face and bawls and Ollie stares dejectedly into the lens and plays with his tie.

The average tale of woe goes something like this: You are an utter computer novice. The only other time you used the word programming in a sentence was when you were giggling at some Hari Krishna madness about turning the Pan Am building into a religious shrine, and your hands-on computer experience is limited to setting the controls on a clock radio. But you decide to take the plunge and make the initial pilgrimage to your local authorized dealer.

So you waltz into the shop and gaze at all the shiny new equipment and watch the demos spin giddily across the banks of monitors. A Svengali-like salesman pries himself away from a knot of Oxxford-accoutered businessmen in a corner burning hundred dollar bills just to wile away the time. He rubs his hands together, motions a cashier to get him a fish-scaling knife and a frying pan, then swings an optical mouse mesmerically back and forth in front of your eyes . . .

"And now, my little Trilby, just sign on the line . . ."

Of course, it isn't until you get it home later that you realize you've just given away the farm for a menagerie of incompatible hardware that would confound an electrical engineer, and no instructions on how to patch the whole works together. So you call the store.

"Uh, excuse me, but I just bought an IBM system and I noticed that out of the 16 parts only two of them say 'IBM.' "

"Two? Well, kid, you're lucky to get

SOMEDAY COMPUTERS WILL BE foolproof. But by then we'll all be dust settling onto some future user's hyperspace drive.

Illustration: Graham Wilson

those. We're e little backed up on IBM equipment right now."

"Are you sure these Kengaroo brand disk drives are as good as IBM's?"

"A reel expert, eh? Ok, well meybe they are a little bouncy, but you're real fortunete to get eny et ell. We're kind of backed up on drives. The Kangaroos will take 5¼-inch floppies fine if you trim them a bit first. I mean, what do you went for Meori craftsmanship?"

"And what ebout the monitor? I've never seen one with e purple phosphor before."

"Stete of the art. Before you know it, they'll all be purple. And the luminescent orenge screen-mask makes grephics reelly pop—kinde mekes ell the imeges strobe. By the wey, whet are you gonne use this for, fella?"

"Word processing."

"Well, you'll get used to it."

"Another thing: I thought you were throwing in e text editor. The only free software you gave me is called *PC Poodle Housebreoker*. But I don't have a dog."

"Bring it back and, uh, bring in a blenk disk end we'll meke you your own custom version of *WordStor*. We do it all the time."

Plugging In

So you get all your hardwere squared away, make a space for it on your desk, shake the loose parts onto the carpet, and try to hook it ell together. And you find yourself confronting Buster's First Law:

The cobles are olwoys wrong.

When I welked into my IBM Product Center, I clearly recall slapping my money down and announcing, "I want to become en expert in word processing." I just don't remember saying, "I want to become obsessed with 37-pin 'D' shell connectors, 34-pin keyed edge connectors, 5-pin DIN connectors, 25-pin 'D' shell connectors, 15-pin 'D' shell connectors, and other devious weys to plug two metel boxes together."

Cables were invented by hardware manufecturers who needed a foolproof wey to pass the buck and get purchasers off their backs. Sure they could sling some jargon my wey thet I heve no possible chance of understanding: "The trouble's in your divisor latch, sonny." But even if they try pulling thet routine, it's still their heedache.

Not cables. Cables connect two different pieces of equipment. This gives the manufacturer of eech component the opportunity to bleme any problems on the other guy's hardware. Vendor #1: "No wonder it doesn't work. It's his feult. He's got e high-bit frammis." Vendor #2: "No, he's wrong. We now vector the signal through the frammis interrupt buffer register. It's the other company's baud rate generator clock signel that's the problem." If you manage to lock both manufacturers in the same room, they'll concede that the hardware might possibly work if you hooked both together properly. They'll look you in the eye and ennounce, "The problem's in your cable." And edd, without skipping a beat, "Sorry, cables are not our responsibility."

CABLES were invented by hardware manufacturers who needed a foolproof way to pass the buck and get purchasers off their backs.

Since no one manufectures the precise cable you need, you buy some plugs and raw cable end try to read the pinouts yourself, drizzle pools of molten leed and tin down the folds of your palms and ell over your *Technicol Reference Monuol*, end then pray the whole thing isn't so shorted out with excess solder thet the back of your unit will throw off sparks like e Roman candle when you plug it in. You string ell the parts together, end then flip the power switch end learn Buster's Second Law:

It'll never work the first time. Quickly followed by a corollary: Or the second.

Since you finally turned it on for the first time late Saturday evening, you get to wait until Monday before anyone can tell you the trick to make it work. Computer store clerks who answer telephones on Mondey mornings don't even ask for your name or why you ere calling. They don't heve to. They simply pick up the phone on the eighty-fifth ring, blurt out, "Your dip switches ere set wrong," and slam the hendset into its credle.

Nut Drivers License

It's a snap to set your dip switches. IBM made it easy. First you lift your monitor off the system unit and find a plece for it. The best place is teetering on top of something else, such as a printer or the arm of a chair, from which perch it will tiptoe unnoticed off the edge and crash into space, tethered only by its bleck umbilical. Then you unscrew the PC case and slide it off. IBM sagely added three more screws to its new covers so this tesk could be three times more fun.

The case goes upside down on the carpet. It was designed by the same guy who invented the veudeville rake that flips up end takes a bite out of your knee when you accidentally step on it. This done, you strap on an ace bandage and reach for your nut drivers.

You mean to say you don't have a complete set of nut drivers? A small screwdriver will also work—you'll need the one thet's ebout one size smeller then the smallest one you own. From here on in, it's duck soup. You disconnect ell the plugs on your add-on boards and carefully put the screws in a place where you will be sure to lose them. This will come in handy later, when all your plugs are held on solely by grevity ellowing helf the pins to work loose, so that you'll tear your hair out wondering why your color monitor doesn't show blue eny more.

Then, either by prying up the soft-metal lips of the add-on boards with a screwdriver so as to permanently bend and disfigure them, or by grabbing the boards themselves with the soft flesh of your fingertips against the spike-sharp tips of the soldered-in components, you wrench them out of their slots and stack them atop one enother, snapping the leads off just enough of the capecitors in the process to fill your screen with permenent static or add a distinctive ripple to its edge.

Finelly, you locate the bank(s) of dip switches, and try to fish a long thin tool into the bowels of your computer to move the microscopic pieces of plastic back end forth. This is simple; any tool you happen to have around the house that combines the thickness of a pencil lead with the

strength of military-grade molybdenum steel will work. Hint: A ball-point pen will ooze blotchy little spastic scratches all over your dip switches, your mother board, and the back of your hand. It will not, however, reset the switches.

Think of it as a game. The object is to figure out which switches heve to be edjusted. Here's the fun part: If you have lots of memory or unusual expansion boards or anything that is not "vanilla," you have to piece together detective clues from the IBM manual and any third-party documentation, and it's almost elways contradictory or at least confusing. Then you try to flick the right switch—and guess blindly if you pushed it ell the way over or not, since there's virtuelly no way to tell from looking at it.

And on top of ell that, you get to replace everything, turn it on, and then, when it doesn't work, go through the whole process oll over ogoin. There is e rumor that IBM wanted to put the dip switcbes in the only more ineccessible plece it could find—inside the power supply—but we can't confirm this.

With Friends Like That . . .

After much trial and error, you numbly replece all the parts for the tenth time, turn the system on, and—surprise! It boots. Then what? You see the very clear, immediately understendable, self-explenatory message:

```
A>
```

Now that really says it all, doesn't it? After a screen like that, I'm ready to plunge in and start computing lickity split. But that's just Buster's Third Law:

There's no such thing os user friendly.

There are two kinds of operating systems. IBM belongs to the tough-guy school: "Hey, it's all here; now you figure it out, Jack." Others prefer the learning disability method: "This menu screen offers two choices—(A) Formet a disk. (B) Blow out your neighbor's stereo with a sizzling burst of RF. Now hit one—and only one—of the letters ebove."

The trouble with the first is thet it leaves beginners out in the cold, and forces even experienced users to dredge up such captivating commands as:

```
MODE COMn:baud[,parity[,
databits[,stopbits[,P]]]]
```

The trouble with the second is that you may have to crewl through seven menus just to get to the commend you need. Or you may find you can't get to it at all.

No problem, you say; just read IBM's superlative documentation. Only trouble is, the manuels you get for free are fat with lechnical mumbo jumbo on things like hooking up your PC to a cyclotron. They are reference books. You want to learn how to initialize disks? Just look it up—under "Format," of course. How about switching between two screens or two serial ports? It's in the manual, ell right, but it's a job to find out just exactly wbere. You mean you didn't learn how to read by picking up a dictionary and starting at page one? Well, no one said it would be easy.

So you buy e book or take e cless. Books are invariably hacked out as quickly as possible to beat other publisbers' versions of the same books to the store shelves. How do you write a book real fast? You rebash the manuel. Throw in e few stock photos of the typical well-dressed middle-class femily floating on lithium and sitting around the PC smiling, and slap the whole works onto the press.

THE manuals you get for free are fat with technical mumbo jumbo on things like hooking up your PC to a cyclotron.

Classes? Plenty of them out there. Most taught by people who, the night before, read the book containing the rehasb of the manual. You welk in and ask about a PC-DOS commend and the teecher scretches his or her bead end says "What's a PC-DOS?"

Shaving The Cat

Now let's make one thing clear. As tough es menufacturers and salesmen and manuels make it for the end-user, half the horror stories you hear are self-inflicted. Many are not; it was a nasty touch, everyone agrees, for IBM to make the color and monochrome plugs identical, which provides some really sizzling graphics right before the cathode ray tubes implode.

But there are hundreds, even thousands, of wise-guy users out there who claim they know the secret trick for hooking up the IBM monochrome monilor to

Strophes For A Catastrophe

A song for home computer users, which can be sung, if you like, to the tune of "Lipstick On Your Collar."

Long before I brought you bome
from the computer sbop
I had many feline friends
who never learned lo slop
Shedding on my manuscripts,
leaving trails of fur;
Now you're here upon my desk,
and this is what's occurred:

Cat hoir in your disk drives,
In your keyboard, too;
Cat hoir in your interfoce
And your CPU;
Bet your bottom hex oddress
It's in your RAM chips too;
Oh, cat hoir in your disk drives
Will make o wreck of you!

Bought a vinyl coverlet,
but it was in vain;
Tufts of fur waft through
the etmospbere like acid rain;
If your heads crash, will my
service contract save you yet?
Or will I bave to teke you
to an electronic vet?

Cat hoir in your disk drives,
In your keyboard, too;
Cat hoir in your interfoce
And your CPU;
Bet your bottom hex oddress
It's in your RAM chips too;
Oh, cat hoir in your disk drives
Will moke o wreck of you!

—Lindsy Von Gelder

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TAX$IMPLE

1040 TAX SYSTEM

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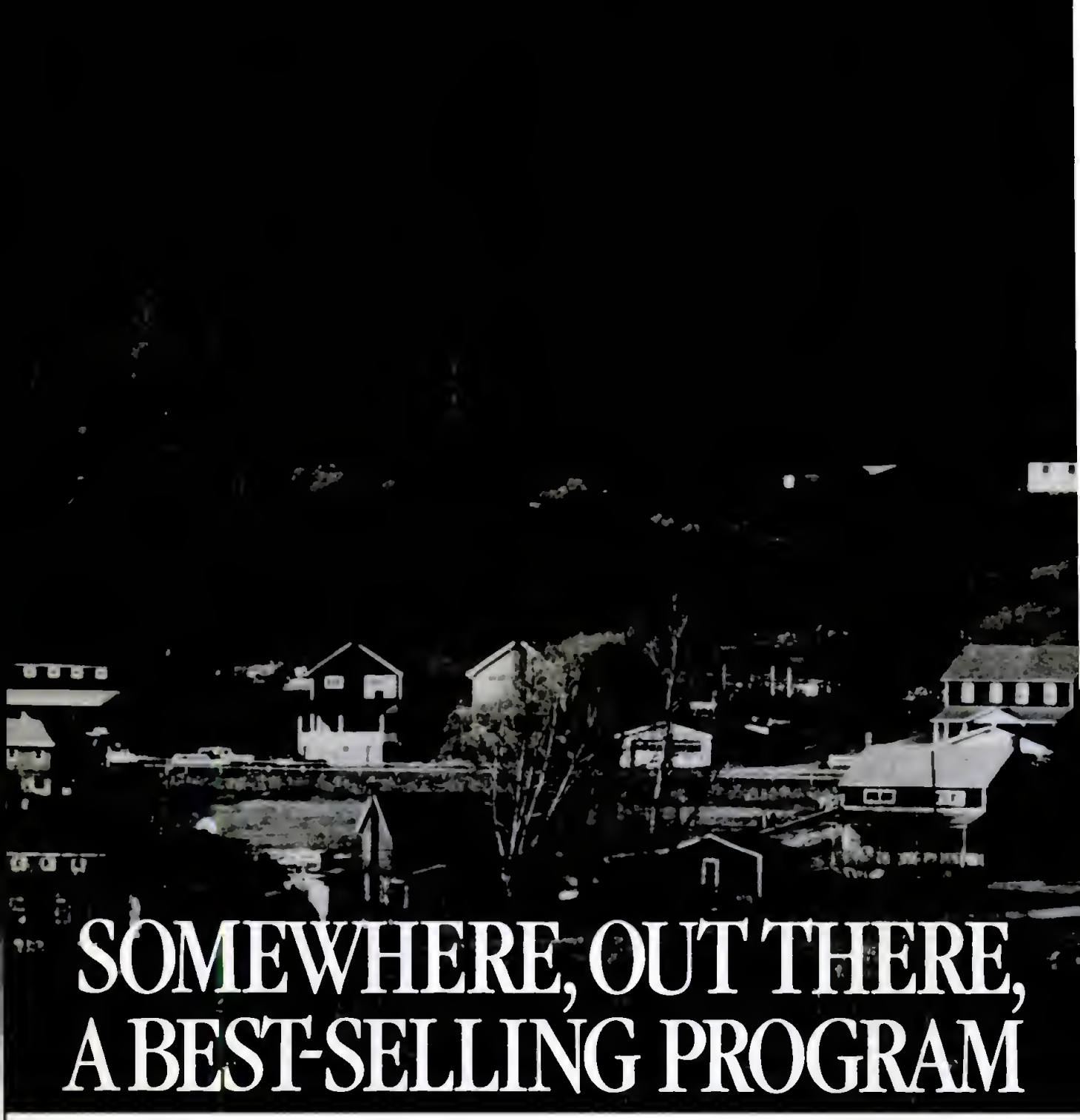

SOMEWHERE, OUT THERE, A BEST-SELLING PROGRAM

WHERE IS IT?

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If you're a program author or publisher, The Software Guild offers some distinct professional and monetary advantages.

First, you devote your time to what you do best: programming. You can leave the manufacturing, packaging, documentation, distribution and customer service to us.

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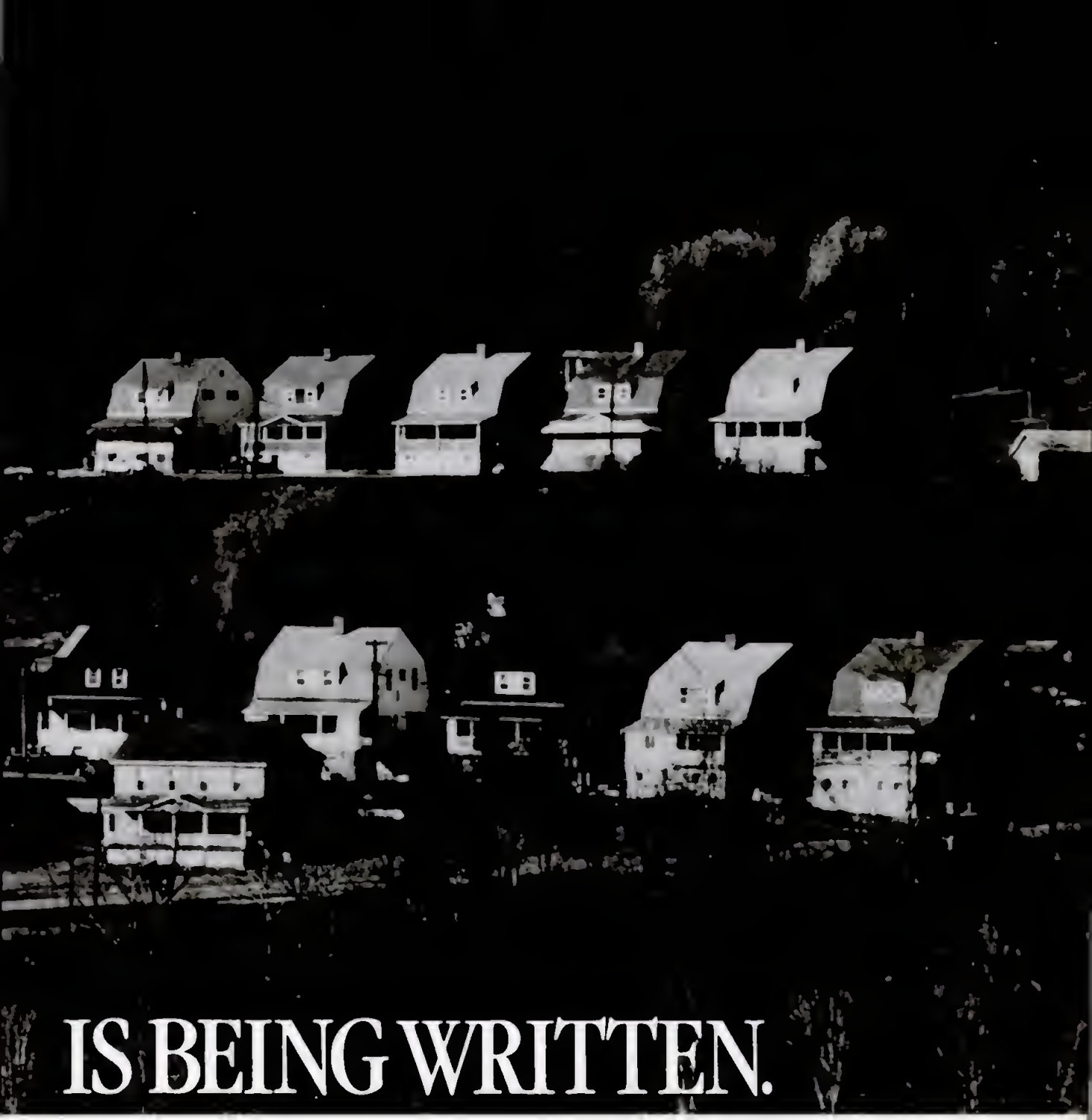

IS BEING WRITTEN.

Third, is royalties. Wider distribution means more substantial royalties. And, your Software Guild royalties start to accrue when the dealer makes his purchase in quantity, so you aren't left waiting while money trickles in.

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the color board and then seem hurt when the back of their unit melts onto the floor.

The IBM PC comes with a nice—albeit puny—switching power supply that can handle surges decently. The unit I have at home is on the same line as an industrial-strength air conditioner and a microwave oven, and when they're cooking simultaneously the only noticeable effect is a slight onscreen stutter as they all vie for the juice.

However, when the PC power supply is going one-on-one with something 100 times its size, look out. Several months ago a SWAT team of effete photographers descended upon us and commandeered an editor's princely office for a thrilling shot of a paper-strewn desk. One particularly obnoxious grip snaked power cables back and forth across the doorway to our office, each time making sure to caution us not to lay a finger on his sophisticated wires, as he strung together a wall of strobe lights that we all assumed were there to simulate the effects of a nuclear flash directly overhead.

I was just putting the finishing touches on a long BASIC program that had taken all morning to code when I heard a distant Bronx accent mellifluously bleat out, "Ok, Chahlie, test duh strobes . . ." There was an angry pop in the hallway as the big lights momentarily sucked every last ampere out of midtown Manhattan. My PC made a quick little whining noise, then shrunk the image on its screen down to postage stamp size and died.

RAM disks are another cause of much heartache. Now that memory is getting cheap, users are loading up to the theoretical limit and turning the extra Ks into virtual disks and print spoolers. But there are some rules to observe here: Don't write a 20-page document on a RAM disk during a lightning storm without occasionally pausing to save it to a floppy. And don't plug the whole system into one of those power strips with an on/off rocker switch that sits at your feet daring you to kick it into the off position every time you stretch your leg. The last thing I want to hear when I have an article floating around only in RAM is, "Oops."

Another old IBM favorite is the parity fiasco. You meticulously set things up, wait until after the thunderstorms have passed, ground your leg to a water pipe, shave the cat, load in a spreadsheet that fills every last available cell, and about 4 hours later, look up from the keyboard and stare in disbelief as the screen twitches and goes blank—except for one nasty line in the upper left-hand corner announcing that the CPU has detected a parity error—and then freezes like a cliff diver at low tide.

WHEN THE PC power supply is going one-on-one with something 100 times its size, look out.

Maybe it was a parity error. Maybe it wasn't. Maybe it was a stray cosmic ray. Who knows? What you do know is that the PC has just matter-of-factly cleared its memory the way you clear your throat. If only you had saved it, or printed it out. But how do you print a spreadsheet that even in compressed mode takes up e full city block? This leads us to Buster's Fourth Law:

You can't ever wolk owoy from a printer.

Apart from the sealed power supply, a PC is just a whole bunch of switches and two moving parts: the disk drives and the printer. Once the chips have survived an initial burning-in period, they'll probably last the life of the computer, unless you are possessed of a nervous mannerism that compels you to flick the power incessantly off and on for long periods of time. But printers are . . . well, as one wag said about members of the opposite sex: You can't live with 'em and you can't live without 'em.

Warm For Your Form

Some printers shimmy like an old De Soto and can even walk off a table. Others vibrate the nuts off their bolts and can commit suicide by splitting apart at the seams. Most are loud, dusty, and cantankerous. It's common to find yourself spending 3 hours and 15 bucks' worth of paper getting a five-line memo to look just right.

But what printers all have in common is the ability to tear and mercilessly mutilate paper, checks, stationery, labels, and other forms. To combat this, you buy expensive forms-handling tractors that provide yet one more level of gears and ratchets to claw your paper to shreds.

Now some dreamers and idlers believe that with the proper software and hardware you can put a box of paper at a printer's feet, queue up a batch of different sequential printing jobs, punch in the correct instructions, walk away and have a meal or take a nap, and then return an hour later to find a neatly stacked pile of completed printouts. Hah.

If you've ever tried this yourself, you know the outcome already. You return and find goblin tracks all over the place. About 2 seconds into the job, the word processor gleefully tripped over an unmatched underline/boldface/triple strike command and spent 15 minutes making the first few documents totally unusable.

Then the ribbon decided to give out, and the printer tore holes in the paper until it got bored. After that, the paper feeder went berserk and started pulling in the paper sideways and wrapping it around the platen, while reaching up and grabbing the already printed forms for good measure and reeling them in as well. You should have noticed something was amiss when the harsh clatter in the other room was replaced by the sound of a rogue elephant choking on a beach blanket.

THE LAST thing I want to hear when I have an article floating around only in RAM is, "Oops."

And on top of all this, printers, more than any other kind of hardware, except perhaps communications equipment, live in a supremely solipsistic world. Learn the codes for one printer? Terrific. Takes a while, but finally you get them down pat. Want to use another? New codes. New setups. New commands. Hence Buster's Fifth:

There is no such thing as computer standardization.

There are so many different operating systems, language dialects, and control sequences that we are now seeing standardization wars. "My standard can lick your standard." "Oh yeah? Says who?" Ever try to communicate directly with someone who is using a different computer? It's like playing charades with your hands tied behind your back. In the dark.

Don't Tread On Me

There is some slight computer "convergence" in the works, and IBM is one of the driving forces. Look, as much as some critics live just to find chinks in IBM's golden armor, others fall down practically speaking in tongues at any release with the three magic letters on it. But the fact is that the PC was a revolutionary machine partly because it took an important baby step from the 8-bit to the 16-bit world, and partly because of IBM's formidable marketing muscle. When the long line of IBM Panzers rumbles into town you either cheer and join in or you eat tread.

WHEN THE long line of IBM Panzers rumbles into town you either cheer and join in or you eat tread.

So competing manufacturers decided to horn in on IBM's territory with compatible peripherals and even full-blown computers of their own. And if you have to embrace a standard, IBM's is a fairly safe bet. Of course, it's also one of the only companies that can write down a billion dollar turkey with a muffled yawn and an axed head or two. And as we all know by now, even standards have their differences. A lot of fast-talking manufacturers will chime in, "Sure, if it runs on the PC it'll coo like a baby on our MS-DOS equipment." No cigar, fellas.

One industry truism is that all computers are either experimental or obsolete. There's no middle ground. As soon as the tool and die makers switch off their Bridgeport millers, and the little white-gloved hands reach onto the conveyor for the first new epoxy board to rattle down the line, the next generation computers are going into prototype silicon, and the one after that into the Vax simulators. By the time the first carton hits the shelves it's strictly old news.

But it really doesn't matter how good they are. Buster's Sixth Law:

Users will always want more.

"Say there, excuse me, I represent a major computer manufacturer and Fortune 5 company headquartered in the Northeast, and I'd like you to sign this nondisclosure agreement and then take a little peek at a new small computer we're in the process of developing."

"Wow, it's awfully small. About the size of a matchbook."

"Yes, but it houses a full 64-bit CPU, running at 32 mHz. It contains a gigabyte of hi-speed nonvolatile molecular film RAM, as well as a CRT driver that pumps out about 64K of colors on a 32K square pixel grid. It's stamped out of one piece of silicon, and will cost about $10 in any quantity."

"Where's the keyboard?"

"The tiny dot in the corner is a microphone. We've finally mastered voice recognition input: any language from Kurdish to Bantu. Fact is, you don't even have to open your mouth. Right now it's picking up your very thoughts."

"Ok, but when are you gonna have one that runs at 128 mHz?"

Kingston Town

Memory is another area where greed quickly overcomes need. When the PC was first introduced, I figured I'd be a sport and beef up my unit from the standard 18K all the way to 64K. I remember watching the salesman's eyebrows climb when I passed 48K, as he was no doubt saying to himself, "Now here's one serious user." In the following months, I found myself stumbling over the same BASIC "Out of string space" errors and vowed each time to buy just a little more. So I splurged and bought an AST combo board with an additional 64K wired in and sockets for another 448K—a total of 512K.

Half a megabyte—the amount that filled gym-sized rooms in the old days. Who could possibly find anything to do with such a vast and utterly useless quantity of memory? I remember chortling superciliously at fellow PC owners who were pricing extra RAM so they could stuff their AST sockets to the limit. Hey, guys, come back down to earth. Who're you kidding?

ONE industry truism is that all computers are either experimental or obsolete. There's no middle ground.

Then I decided to toy with the disk emulator software that AST threw in with its expansion board. From the moment I saw that first C: up on the glass, I was irrevocably and hopelessly hooked. Disk-bound word processors crawl through long files when searching front to back; on a RAM disk they fairly fly. My real disk drives sound like steel drums anyway, and I'd rather have my fingernails extracted than be forced to sit and listen during a long string search as my Tandons bang out *The Best of Harry Belafonte*.

So I snapped in another 192K, found it wasn't adequate, then quickly added 256K more until I had pushed my total up to a whopping 576K. The IBM diagnostics don't even go that high, and some of the DOS utilities have to be tweaked so they don't crash when they hit anything above 320K. Now that's a lot of magnetism under control; at 2,000 characters per page I can load up 288 pages of text, spilling over from C: onto D:

But it's not nearly enough. I want more. I need more. Much more. Hmmm . . . I see that the *Technical Reference Manual* shows 912K of space that's not urgently spoken for; tomorrow I'll place the order for the rest. Once you have your files and programs tickling each other at the speed of light you'll be spoiled for life.

Of course, I'll do anything to avoid using those clattering Tandons. The batch

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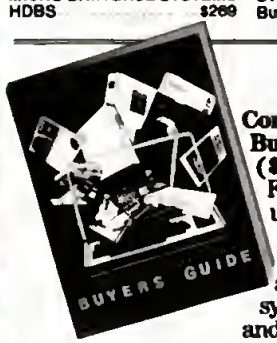

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file that kicks in the two RAM drives, sets all of the cockamamie parameters, and shuttles files off the floppies into the right partitions of memory takes 2 minutes to grind through, but it's well worth the weit. Apart from the cacophony, I've been terrified from the beginning by the six little comic strip panels on the back of the floppy sleeve, and frankly, the less contact the better. I mean, this computer sets you back five grand stripped down, and the best its mass storage wizards heve been able to come up with is rust on plastic? Gimme a break.

No metter how careful we are around the office, our floppies tend to migrate into tall stacks of jecketless, mislebeled disks that bake on the sooty windowsill, mysteriously interleaved with sheets of 000-grade sandpaper end wet margarine wrappers. To combet this, we do what every other red-blooded PC owner does:

WHEN THE goblins want to get you, they come at you with a vengeance.

We churn out four and five duplicete disks, each one e slightly different version of the original. Then, when the heed bites down into the master disk and sheves off e golden-brown curl of iron oxide, we ere confronted by the maddening task of guessing which copy is the newest; we don't bother dete-stemping them since that would take too much effort.

If you're just learning the ropes, disks can drive you crazy for countless other reasons. Switch disks inadvertently et the wrong time, for instance, end you court disaster. The PC doesn't check first to see if you're writing to a disk it has seen recently, end you can end up with cross-linked files or total garbage. Mix DOS 2.0 and 1.1 and you may end up with severel hundred thousand bytes of pure gibberish. Save e file to e drive that is sliding out of alignment, and then try to read it back after you've had the drive repaired, end you're out of luck.

But what can really send you over the edge is that a disk may simply go bad, even though you kept it away from greasy pizza cartons, cryogenic magnets, and pottery kilns. Nothing stops the heart faster than e cheerful messege on your screen such es "Disk boot failure" or "Disk error reading drive A," especially when you were trying to boot the disk in the first plece to make e backup copy. Such problems are guaranteed to make you as paranoid as e Woody Allen charecter.

Error Code Catechism

This attitude is not limited to naive beginners. Some of it is plain old self-defense against the computer goblins. There is much truth to Buster's Seventh Law:

If you get into the computer field and you don't know what you're doing you get screwed.

Computers are very seductive, especielly for tyros. Once you get one little thing right you think you can rule the planet. You get cocky. Then you try to do something e little tricky, end fester then you can grope for the Ctrl-Breek, 2 weeks of solid work flash into the bit bucket. Of course you also have to remember Buster's Eighth:

Even if you hove 15 yeors of computer experience, you're still going to get screwed.

You can know every error code of every micro language by heart, recite them on demend in numerical ond elphebeticel order like a Heshemite prince reeling off the Koren. It just doesn't metter. The more carefully you plan, the more subtle the problems you encounter. The more you learn ebout computers, the tougher the jam you menage to wedge yourself into.

And when the goblins went to get you, they come et you with e vengeence. Buster himself, the Compleet Computer Wizard, once installed several similar systems in different locetions. Each of his clients, it turns out, is delighted with the peckage, which includes an ultre-relieble Date-South printer. One dey Buster gets e messege to come end make e condolence cali on one of his trusty dot metrixes. Seems the unit bangs out four end e half peges and croaks. You let it rest, four pages, no problem. Half a page later—the end.

Buster puzzles over this, field strips it (he can do this by now in his sleep). While he's knitting his brow deeper and deeper, he gets another cell. System number two hes e curious problem. Printer fine for four and one-helf pages. Then gives up ghost. Come quick. He does. Same story. Sure enough gets third call. Whet can it be?

Buster inspects third problem machine. Lifting it and moving it works up e sweet. Buster removes jacket. Thet's funny. Getting warmer now. Hear the steam heat hissing up through the walls. They just turned it on, client says. That's funny. Calls other clients. Seasons changing. Other clients just turned on heet too.

Buster dons calebash and deerstelker. Maybe peper spinning through printer is building up static charge. Doesn't reach critical level until nearly et pege five. Steam heat doing funny things to eir. Too early to buy tinsel. Buster runs wires from the printers to e nearby ground. Goblins vecate premises.

Brutal Crashes

The hardware goblins are not elweys easy to beat. Sometimes they find their wey into ROM or e controller card, where they cower until you can pluck them out. Fortunetely, IBM can rely on its web of powerful interrupts to head such problems off et the pass.

But most of the horror stories we hear come from program problems. Buster's Number Nine:

There is olwoys o bug in the softwore.

It is simply not possible to protect ageinst every conceivable hardware and user defect. Some slepdash software is buggier then e Botswana termite mound. But most slick canned peckages have been tested to deeth, and will anticipate trouble and fend it off.

The real trouble is subjective bugs, and not enough ettention has been focused on this area. It's easy to pick on e program that crashes if you enter e number when it asks for e letter. But there are serious software design flews thet ere problems to some people and business es usuel to others. Many programs run flawlessly on e monochrome screen. But route the displey through the color/graphics edapter and you end up with grey-on-black and e severe case of eyestrain.

So maybe not every user wants to run *dBase II* in color. But there are plenty out

there who do—or at least who would if they could. Actuelly, now you can.

No discussion of bugs would be complete without e quick voyege into MicroPro's deep weters. WordStor has more annoying peccadillos than most other programs have total features. It would be a pleasure to see onscreen underlining. Or check automatically for unpaired boldface commands. Or handle reformatting of double-speced text more adroitly. Or do a hundred other tricks a little faster and with fewer keystrokes. And WordStar's crashes are brutal. But mention thet you'd like to take away our WordStors and them's fightin' words around these parts.

Buster's Tenth is a general purpose law and applies here:

You can get used to anything.

When WordStor 3.3 is on a RAM disk, and you have plenty of space for your files, end either e cleverly installed set of function key commands, or a sensational program like ProKey, nothing can touch it. It really *flies*. And it offers astonishing power, especially when you hook it to its misnamed formetter, MoilMerge. SpellStor is another matter. It's puny and inelegant. And it was definitely written by gremlins. Its previous incarnation would crash when it stumbled across any 7-letter word beginning with re. Hard to believe but true.

One WordStor goblin is downright insidious and deadly—the dreaded accidental Control-Y. To delete e word to the right of the cursor, you hold down Ctrl and tap T. But to delete the whole line, you hold down Ctrl and hit Y. Since these keys are next to each other, it's easy to expunge an entire line when all you want to do is wipe out one miscreant syllable or punctuation mark. [Ed. Note: We'll show how to correct this bugaboo, and perform many other examples of WordStor legerdemain, in an upcoming issue of PC.]

If you think that's a lot of copy to describe an esoteric problem for a small market, consider this: Several months ego MicroPro cleimed it had sold ebout 50,000 PC-DOS WordStor copies. This probably transletes into ebout 200,000 to 250,000 actual IBM PC WordStor users.

The Fix Is In

You want a real horror story? Consider repairs and customer service. MicroPro makes a fine word processor, but it regards end-users with something lower than contempt. Call MicroPro yourself and see. Most vendors and retailers seem to have hired the rudest, least petient, most unciv-

PRYING out row after row of fragile, inaccessible chips is only slightly less fun than yanking your own molars.

il ex-civil service workers they could lure away from their old no-show, goldbrick jobs, who leave callers high and dry and feeling far worse after the call than before.

Then there are the end-user-bedemned service employees who probably have chips on their shoulders because they could not find jobs pulling the wings off flies or pushing little children off bicycles onto the asphalt.

Why, I could tell you stories that would curl your cables, all dead true. As highlighted briefly in Corey Sandler's "From the Editor's Screen" in this issue, several months ago the speaker in my own PC started to wheeze and gasp and I decided to collect on the several hundred bucks' worth of IBM service contract largesse I had been dispensing. Since I had purchased a slew of non-IBM parts, such as disk drives and combo boards, I carefully removed the offending hardware.

(IBM servicepeople won't touch a unit if it has even one non-IBM screw in it. This can be especially irksome if you buy an XT or one of the new 256K-RAM-socketed PCs without the full complement of mother-board memory. It's hard to say whether they'd catch you, but if you bought the bare minimum from IBM and then plugged in your own chips, you'd technically have to pull them all before you brought your system in to be repaired. Prying out row after row of fragile, inaccessible chips is only slightly less fun than yanking your own molars.)

I then painstakingly packed the thing in its original carton, with all the original packing meterial to cushion it. I wrote my name and address in large letters all over the outside of the box and dropped it off at IBM's one repair center. "Sure, no problem, we'll heve this back to you in 24 hours." All the repairmen eventually did, by the way, was rip out the old speaker and plug in a new one, which they could have done in 5 seconds while I waited.

Well, that's not all they did. They washed out the inside of my PC for me too, no charge.

The day after I left it with them, the skies opened early in the morning and unleashed a typhoon the likes of which Gotham had not seen before or since. A close friend had already wasted the entire morning waiting at home for the messenger to arrive. When it started to get late, I called IBM to find out the reason for the delay. The serviceman growled distractedly into my ear: "Went outta here hours ago, I dunno; it'll turn up."

An hour later the phone rings. A barely articulate messenger asks me for my address. A bad sign. "It's the one on the box." I tell him again. It turns out he's trying to deliver it on the wrong side of town and he swears he'll be over in a few minutes.

Two hours later my friend calls to announce that the messenger had finally shown up. "Uh, you'd better sit down, though." She reels off the facts as my choler arches skyward. Seems the guy had breezed in, holding my PC like a suitcase, his fingers looped through the strut that

THE veins in my temple are throbbing so hard you could take my pulse from across the street.

separates the two disk drives on the front of the machine, carton nowhere to be seen. He then dropped the system unit onto the floor as if it were a tired armload of wet logs. About 3 inches of dirty water cascaded out.

Now, I'm not exactly what you'd call imperturbable, especially when it comes

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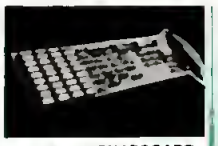

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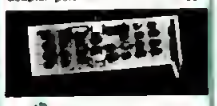

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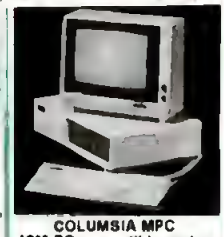

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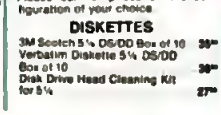

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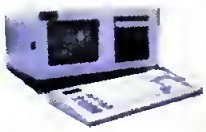

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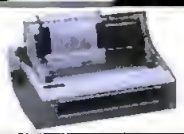

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to messing with my PC. No liquids are allowed within 10 yards. No cigarette smoke within 20. I keep it tightly covered. There isn't a speck of dust on it. Or a thumbprint. It's so clean you could—god forbid—eat off it. NASA could assemble a contamination-free satellite inside it.

I call the repair center. I am a trifle ruffled. The veins in my temple are throbbing so hard you could take my pulse from across the street. "Why didn't you pack my PC in its carton?"

"You didn't give us one."

"Yes I did, my name's written all over the outside of it."

"Oh, yeah, hold on, here it is."

"My PC is filled with dirty water."

"Well, that's not our problem. Take it up with our messenger service. . . ."

ONE industry truism is that all computers are either experimental or obsolete. There's no middle ground.

At this point, I don't remember the exact words I used, but they were something close to "Well, I beg your pardon, kind sir, but I truly and respectfully feel that you are in error." I may have added a suggestion that he try what I now realize is a near-impossible calisthenic exercise, and I do recall making a slight reference to coming right down and tearing out his heart—but as I said, the details are a trifle fuzzy.

In any event, he reluctantly volunteered to replace all of my cards, including the mother board, *gratis*. Even returned the carton the second time around. Speaker works like a charm, too. Except that now if the room is very quiet I can hear very faint tweedles and beeps as the CPU buffs and puffs through all its tasks.

Buster's Last Stand

Think about the horror stories of the future. When Bell or some other smart operator hooks us all together electronically, there will be digital snoops who intercept personal mail. Computer vandals who get drunk with power and go on a tear trashing your files from across the country. Felons who key in and help themselves to your electronic bank account. Practical jokesters who tie into your line and order you one of everything from the onscreen merchandise catalog.

"Did you ever notice," asks Buster, "how in every futuristic science fiction story about computers, the machines never get creative? They just become bitchy and nasty."

On top of all the human troublemakers, what happens if your future PC develops a personality and doesn't get along with you? What if you send someone a message and it doesn't like your political viewpoint and makes some changes—or sends some of its own messages in your name?

When all the machines out there are eventually wired together via AT&T, will they form nodes on one monstrous uncontrollable international brain/network? Will they add still more idiotic demands for changing the language to excise "machinist" neuter gender references? Will they intercept messages about replacing themselves with faster machines? Will they gossip with other machines about their user's personal E-mail? Will they blackmail us by encrypting files and refusing to decrypt them unless their demands are met?

Buster doesn't think this will happen. "The way we conquer computer problems today is to make ourselves think more like machines, rather than vice versa." We're becoming increasingly reliant on computers, and are resigned to putting up with arcane codes, rampant incompatibility, frequent crashes, and baffling hardware problems. Which brings us to his last law, number 11:

Everybody thinks computers are smart. Computers are stupid. They're just fast.

So they can sort database records PDQ, or bollix them up just as quickly. But your PC won't get that spiteful and ornery without some pretty powerful future software leaps. For today, leave this to the hardware vendors, retailers, repairmen, software authors, and pig-headed users already out there. The day my computer develops a political consciousness and a grudge—and admits to me that it finds the scent of panicky adrenalin to be the sweetest perfume—is the day I pull the plug. Fortunately, this won't happen for a few years.

There is no totally foolproof way to exorcise the PC goblins. Part of the lure of computing at this primitive state is the pioneer aspect of it; disks are too fragile, operating systems and software too buggy and pokey, electronics too susceptible to electric company caprice, manuals undecipherable, and both support and standards virtually nonexistent.

And yet, even if you handle your disks with surgical gloves and lock them in a lead vault, learn every last software trick and caveat, plug all your equipment into an uninterruptable power supply, and aim a loaded howitzer at any repairman who shows up to fix a recalcitrant component, the PC goblins will still get you. A waterpipe will burst in the wall. Vibrations from your printer will work the screws out of the legs on your desk and topple the whole works. You'll be running three RAM drives and two floppies and lose track of which is which and mistakenly write the old file over the new. Or maybe the aurora borealis will seep down into your window and fry the oxide coating off your disks. You can't win.

I MAY have added a suggestion that he try what I now realize is a near-impossible calisthenic exercise.

On the other hand, is there any user out there who'd trade in his computer for a typewriter, filing cabinet, ledger pad, and adding machine? You've got to be kidding. Try to remember this as the tar drips out of your transformer and onto your shoe, or the whole day's work vanishes into a quirky parity error, or your new printer insists on typing an entire critical document onto one spot at the extreme right-hand edge of your platen.

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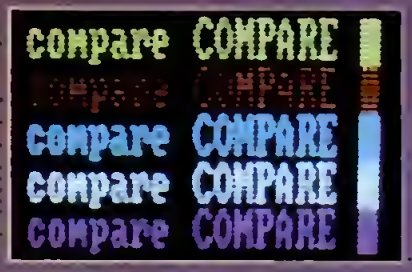

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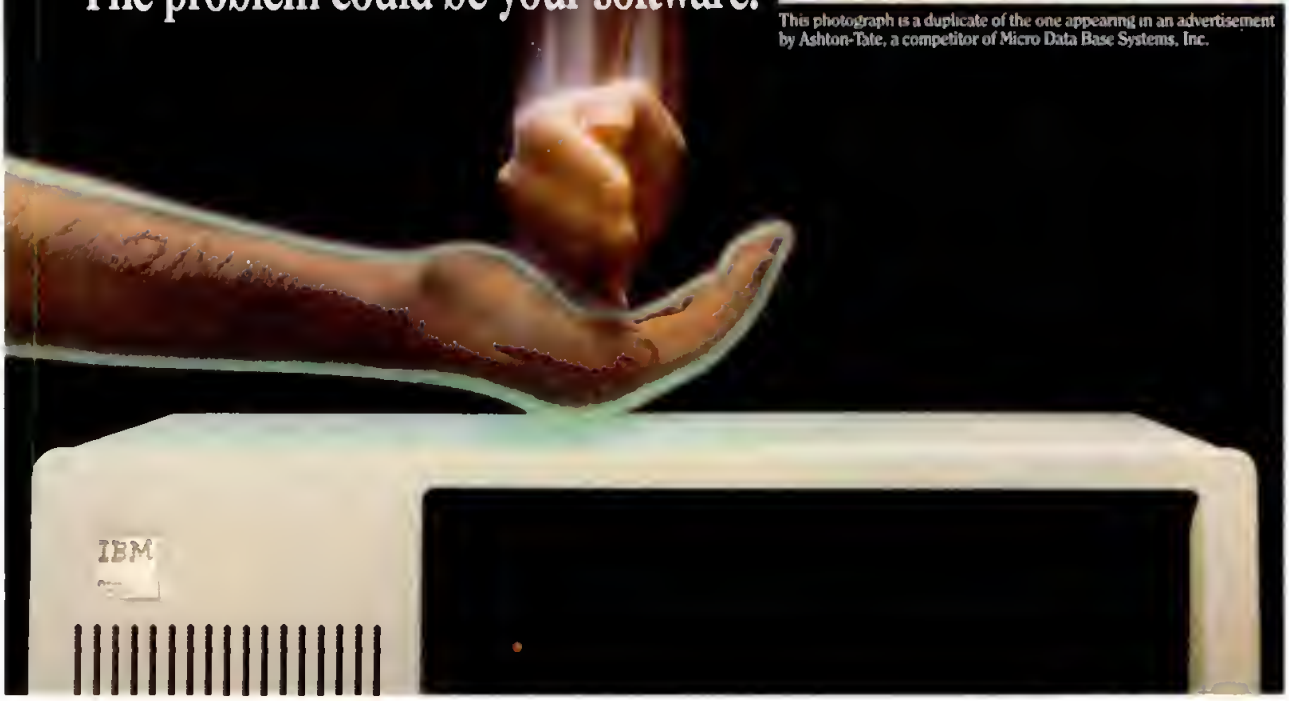

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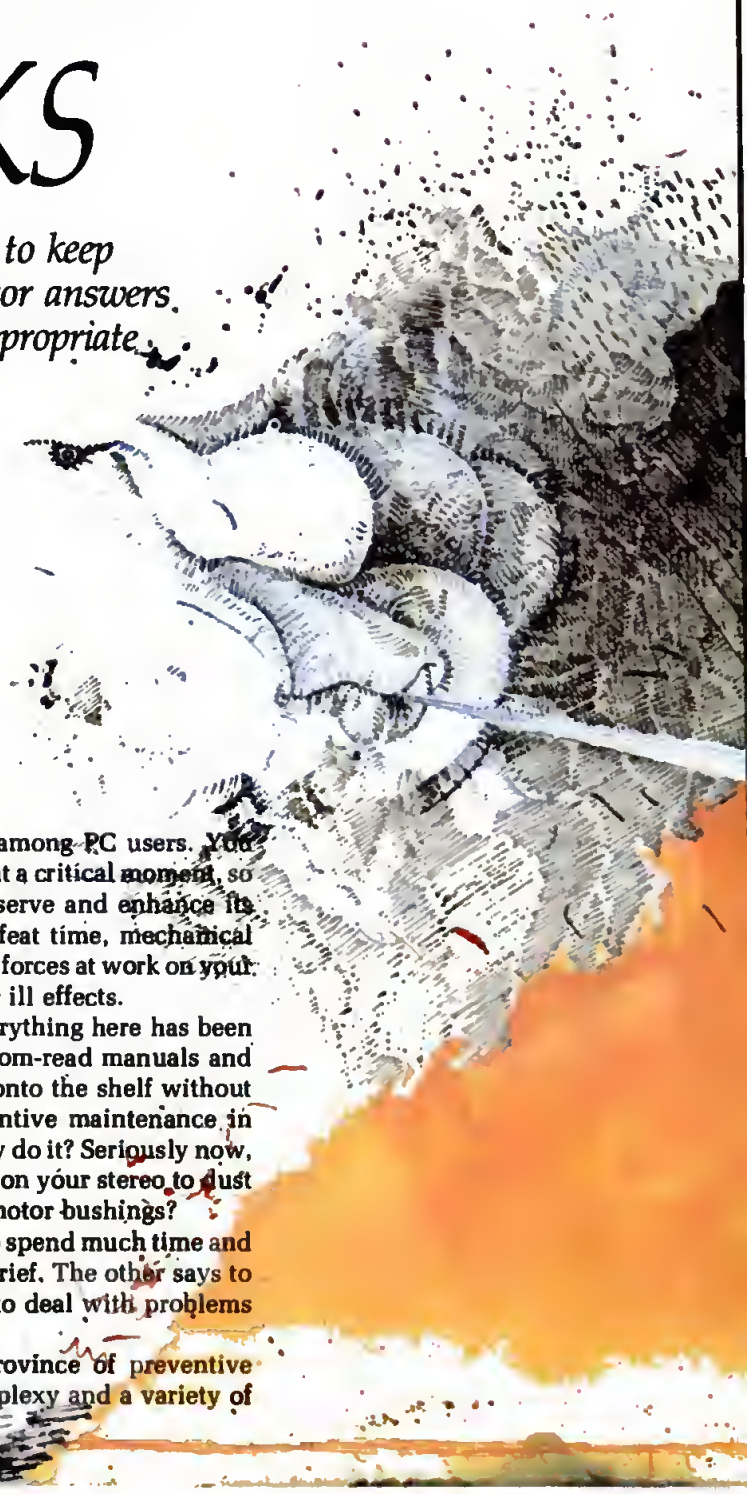
CIRCLE 525 ON READER SERVICE CARD

COVER STORY/BILL MACHRONE

RUN IT TILL IT BREAKS

How much care should you take to keep your PC healthy? Our technical editor answers with his laid-back philosophy of appropriate preventive maintenance.



Preventive maintenance is a hotly debated issue among PC users. You don't want your pride and joy to fail, especially not at a critical moment, so you naturally do everything in your power to preserve and enhance its functionality. What are your choices? Can you defeat time, mechanical wear and tear, and other ravages? We will look at the forces at work on your PC and discuss what you can do to minimize their ill effects.

First off, there's nothing new in this article. Everything here has been published elsewhere, in these pages or in the seldom-read manuals and guides that usually go right out of the carton and onto the shelf without being opened. Sure, there's information on preventive maintenance in there, but even if it did any good, would you actually do it? Seriously now, how many of you have ever once cracked the cover on your stereo to dust out the pots, or file the carbon off your Cuisinart motor bushings?

There are two schools of thought here. One says to spend much time and trouble puttering around trying to forestall future grief. The other says to spend that time actually using your machine and to deal with problems when and if they arise. The latter is a default.

Power conditioning isn't strictly within the province of preventive maintenance. What it does prevent, though, is apoplexy and a variety of

AE.C.63

splenetic afflictions. But then, there are many varieties of power conditioning. The PC has a switching power supply and, therefore, doesn't hava much need for spike absorbers or constant-voltage power transformers. I hava yet to see a personal computer of any parentage lose data or malfunction because of noise components on the power line.

Dropouts are another matter antirely. Do you earn your living with your PC? Do you store critical things in memory, write novels on your RAM disk? If so, you had better get an uninterruptible power supply or standby power system. These units detect a power interruption and kick in with generated AC power ln 1/120 of a second and sustain it for 10 minutes to half an hour. A unit that will do the job for you goes for as little as a few hundred dollars up to maybe $1,500 for a monster power system. Life is too short for the kind of aggravation that power losses can cause.

BE SURE you've exhausted all the alternatives before you resign yourself to wearing a lightning rod on your head.

Illustration: Alan E. Cober

Static Electricity

Nikolai Tesla or Charles Steinmetz might have been able to produce an electrical discharge big enough to knock out a PC, but most of the rest of us can't. If you have an intermittent-failure problem that you're attributing to static, be sure you've exhausted all the alternatives before you resign yourself to wearing a lightning rod on your head and a ground strap around your waist. That means going through all the problem-determination steps in the *Hordwore Mointenonce ond Service Monuol*. On the other hand, if your heart fibrillates every time you reach for a doorknob, and if the cat runs from you in tarror, maybe you should consider a humidifier or a different carpet or a commercial grounding mat around the computer.

Dust

Dust and data don't mix. The omnipresent motes in our environmant affect the components of our computers in different ways and to varying degrees.

Why do manufacturers insist we not touch the magnetic surfaces of floppy disks? Because the oils on our skin get onto the surfaces. Do fingerprints confuse the floppy disk controller? No, but they do hold dust, which is abrasive and wears down both the read/write heads and tha recording medium. So don't touch the disks and do keep them in the jackets.

Your monitor is actually a poorly designed dust precipitator. The high voltages and smooth surfaces are ideal for attracting passer-by particles. Does it hurt? Only your eyes. For a real treat, go get a bottle of Windex, and clean the faceplate of the monitor. How about that? Not only can you turn the brightness down an eighth of a turn, but you've rajuvenatad the anti-glare surface by removing all the fingerprints you left when you were debugging that last program or showing someone how your spreadsheet program works.

How about a dust cover? What's the point when the rate of dust collection is probably 10 to 20 times higher wben the monitor is on. If you're going to be a fanatic about it, why not disassamble it once a month and clean out all the dust that has collected on the inside? Because it's not hurting anything, that's why. I've seen some old color TVs with an inch or more of bunny fur on the back of the CRT and power sections, and they run just fine.

You probably shouldn't use your PC in rooms where people are sanding plastar, grinding pig iron, or doing body and fender work. If you can withstand a particular work environment, so can the PC. A hovering horsefly moves more air than the fan in the PC, so don't be overly concerned about sucking dirt into the systam. What little airflow there is brings dust in with it, and, of course, there are no filtars on the inlets. Not only is that not a problem, but it's inevitable. It's not your fault that the internal aerodynamics of the system unit are contrary to virtually any other computer ever designad. Most pull in air through a single port (which often has a filter over it) and then blow it over the boards. This pressurizad case approach cannot be implemented in a PC, given its design. With all due apologies to the manufacturer, the accessory that makes ma laugh the most is the cover that fits ovar the drives. So you get to wipe the dust from the covar instead of from the front of the drives. What have you gained? Such davices are strictly for the compulsivas.

It's possible that a very humld environment, such as on a boat or on a waterfront, could accelerate corrosion on the metal contacts inside the PC, but even then it would take years before tha machine became inoperative.

The keyboard is the one component where preventive maintenance makes sensa. Dust gets into the key contacts and causes missed keystrokes. The usual cure

for dust in the contects is to wreak one form of physical violence or another on the keyboard to dislodga it. A dust covar for the keyboard is probably a worthwhile investment.

And then there is the matter of soft drinks and coffee. Go ahead, balance your coffee cup on the system unit next to the monitor. Keep your cola on the keyboard

MAYBE keeping liquids at bay isn't strictly preventive maintenance.

ledge. Call me when you spill it and I'll play you e swell version of "Ebb Tide." One thing is sure: it'll ruin your whole day. Maybe keeping tiquids at bay isn't strictly preventiva maintenance, but it sure can save some heartache. Liquids containing sugar are deadly to electronic componants, and only a commercial vapor degreaser will remove the conductiva residuas that remein.

Peripherals

The only peripheral that really requires any attantion is the printer. Peper is pretty dusty stuff, and the dust is abrasiva. Vacuuming it out once in e while won't hurt. Follow the manufacturer's recommendations on lubrication. Some mechines require it and others ebbor it. Special peripherals hava special needs. If you have a pan plotter, music synthesizer, or laser printer, accord tham the respact that is due.

Wrap-up

Preventive maintenance for your PC is about the same as preventive maintenance for your clock radio. Run it 'til it breaks. Given the inherent reliability of the components, you may well just throw it ewey et that point because it's been uttarly eclipsed by naw technology. If you insist, you can waste all kinds of money on your PC. You can probably find someone who will "tune it up" for you and who knows what else. Forget it. Enjoy your computer and stop worrying about it. */PC*

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CIRCLE 201 ON READER SERVICE CARD

WHERE DO YOU GO WHEN THE LIGHTS DON'T GLOW?

When your PC is on the fritz, should you turn to IBM, an authorized dealer, or a third party for repairs? The following guidelines will help you sort out these and other service options.

Drew Clausen couldn't believe his eyes. A delivery truck had pulled up to his ComputerLand of Downtown Los Angeles store. As Clausen tells it, "The driver started throwing IBMs off the back of the truck. We ran out and said, 'What are you doing?' and he said, 'I'm testing them for you.' "

Luckily all the PCs in Clausen's shipment survived that "moving" experience in perfect shape. A police department computer on the West Coast wasn't so lucky though; it got shot by an angry deputy sheriff. And other users have been known to drop (or hurl) computers with such force that they don't survive intact.

Now, this sort of thing, along with more likely goof-ups, such as leaving one screen

on so long thet the image etches itself indelibly on your display, is considered misuse or abuse end, as such, is not generally covered by service contrects, or by your warranty aither, for that mattar.

The good news is that if you're not in the habit of using your mechine outside in the rain, and if your kids don't pour Coka in your disk drivas, sarvice won't ba one of your big worries. The reliebility of electronics products these deys is remarkable.

And it's no secret thet the PC has baen turning in a pretty impressive performance. PC service fecilities eround the country (IBM, deelers, and third party) report few problems with it. Talk with PC owners and users about what's gone wrong, and you probebly won't hear all that much about hardware problems. Calls for halp often turn out to be software-related or the result of user befuddlement. Reteiler Clausen cleims his biggest servica problem is "the loose nut behind the keyboard."

But things can and do happen. If some part of your system goes on tha fritz, it's nice to know that IBM has more than 100 service fecilities in key places ell around the country. Sorbus has 165. Add the more than 1,000 authorized IBM dealers, plus local third-party servicars, end you'll never hava to go far for halp.

Under Warranty

If you bought your PC at an authorized IBM dealer, any other authorizad dealer, end IBM itself, must service your mechine on a carry-in or mail-in basis. If you bought from en outlet not authorized by Big Blue, your service choicas are defined by tha store. Thase can range from no warranty or initial period backup to e progrem sat up by the store. One New York store, 47th Straat Photo, has arrangad with Sorbus for a 90-dey service guarentee thet includes on-sita service.

So, one wey or tha othar, your PC is covered for its first 90 days. Tha only thing to remember is that IBM, during tha warrenty and after, will not service any non-IBM components. If you hava a Quadboard, a Tecmar 1st Mate, Tandon drives—anything that's not from IBM—you'll have to turn elsewhere for servica on it. Chancas are that IBM facilitias will even ask you to remove it before servicing your IBM equipment.

It's not that IBM is unfriendly. A large part of its service arrangemants for the PC are directed at providing support and backup for its deelers es e meens of encoureging repport with their customers. Tha company's service centers ere more than glad to taka care of hardware problams end even do soma troubla-shooting in the user's never-ending fight against glitches.

RETAILER Clausen claims his biggest service problem is "the loose nut behind the keyboard."

But in IBM's view, the deeler is ultimately responsible for satisfying PC users. Thay sold tha systam in the first place and "ara in the best position to assess what the customer needs and to respond to those needs," seid Welter Briggs, IBM maneger of marketing support. "Our emphasis is to provide tha dealers with the training and resources end backup and parts and logistics to go ahead and do that job batter than anyona elsa in the industry. The dealer has the ability to coordinate any end all combinetions of hardware end software."

In any cesa, heving a hybrid system is just one more thing to consider in deciding whet to do after the warranty axpires. As good es the equipment is, if you heve it long enough, at soma point something will fail and you'll need service. What's the best course? A servica contract? Winging it end shelling out when somathing happens? Do-it-yourself?

A Personal Question

As it turns out, where to turn for service support is a vary personal question. How often do you use your PC? Are you an everege home user or a business running it 24 hours a day, 7 days a week? If this is the case, chances are that you'll get faster service if you have a sarvice contract. Do you require on-site servica? Naither IBM nor Sorbus will make house calls unless you

IT'S UNLIKELY that any repair, on any basis, is going to take more than a week.

Illustration: Mike Kanarek

have a contract. Many of IBM's authorized dealers will, but be ready for possible price tags of $75 or more an hour. And without e contract, anything you try for—on-site, pick-up, carry-in, or mail-in—may take longer and be a more complex transaction. A call to IBM's PC service department in New York, for example, produced the information that we had to call (800) 428-2569 and have a number assigned to us before we could bring our keyboard in for servicing to 590 Madison Avenue.

On the bright side, though, it's unlikely that any repair, on any basis, is going to take more than a week, and the more likely time frama is 24 to 48 hours. For one thing, most parts of the system can be repaired eesily and quickly once the trouble is identified. For another, IBM has set up an element exchenge-program option that allows you to exchange a failed part for a working one.

There are some 125 pieces to the system, including boards, the entire keyboard, the display, the disk drives, parts of the printer, literelly all the options, which IBM definas as field replaceable units (FRUs). Most repair facilities at IBM's authorized dealers, and at IBM's own facilities, work on a FRU basis. The failed or failing element goes back to IBM, and you get either e brand new or completely rebuilt unit in its place. In either case, the part must satisfy IBM's quality checks and stendards.

To some extent, the contract also ellows for better communication between the service provider and the end user, observed John Puccini, new products and service manager for Sorbus. "Wa can do a better job with on-site service than we can otherwise," he seid. "When the customer calls, we'll call back and see if we can help him over the phone. It may not be a hardwere problem. Also, since he has a contract, we'll know befora coming out what configuration he has, and having talked to him, we'll know what parts to bring." Customers with carry-in contracts elso have an advantage over those who just come in when somathing blows, Puccini continued. "If it's under contract, we'd be more likely to change the part even if it's not clearly broken, but just giving you lingering problems." Under the terms of virtually all service contracts from all providers, the costs of both parts and labor are covered.

Help Lines

Most business users would probably be better off with a service contract, especially since it can be written off on their taxes. The user who never touches the machine obviously isn't going to worry about repair problems. It's all the PC owners in-between who have to consider the tradeoffs.

Probably the key question, Puccini said, is "What is the cost of an unusable machine? Tha important thing is not that a contract will cost, say, $300 a year. It's what will it cost not to have it."

The service companies also are selling an extra level of support and help to end users who are not proficient at troubleshooting. "It may not always be the mechine," said Puccini. "If you have a service contract, there's a good chance we can fix it for you over the phone. It may be human error. We're here to tell the users what we can. After all, it's cheaper for us not to have to make the service call. If it cen be answered enywhere within Sorbus, whatever the problem, you'll only make one phone call."

Summing up the experience so far of

Most Likely Troublemakers

Anything can go wrong, but some items are more likely than others to require servicing.

Thare was no hope for the construction site computer that happened to be in the wrong plece when a wall collapsed. And there probably wouldn't be much hope for a keyboard or disk drive victimized by a spilled soft drink.

But most things that do go wrong with your PC—the things that are covered by service contracts and can happen in normal usage—can be fixed.

IBM and other sarvicers have pretty specific information on what appaar to be tha main trouble points.

Printer the Main Trouble Spot

Clearly, the most mechanical part of your system is the most vulnarable to breakdown. John Puccini, Sorbus' new products and service managar, said, "It's not unusual to see between one and three failures a year with normal usaga. It can go to four or five, depending on application and on the type of printer."

Having nothing to do with specific brands, some printer designs appear to be generically more vulnerable to failure than others. But whatever model you have, be prepared for ribbon jams, papar jams, and other mechanical problems. Keep in mind, too, that most service contracts on printers don't cover the printhead.

Electronics problems with printars appear to be reletively rare; many are caused by extarnal bugs, perhaps from the power source or by impropar interfaces.

Other Sources of Trouble

After the printer, the disk drive is most likaly to require service. For all parsonal computers, two out of every four service calls Sorbus gets are disk-related. Of the othar two, one will ba on tha monitor or keyboard, and ona on the systam board or power supply.

Most disk problams appear to be due to damage, mishandling, and, according to Puccini, "plain old dirt." Repair facilities see their share of misalignment and compatability problems as wall.

So far, no one sees any "particular pattern" in board failures, seid IBM manager of marketing support, Waltar Briggs. But, ganarelly, larger boards with greater numbers of components can be expected to fail most often.

There's no predictable or particular time frama, either, for the occurrence of board problems. A system board may run 2 years or so with no problems, or it may go at any point in that tima frama. Luckily, there are relatively few board and aystem unit problems with tha PC, based on talks with several service providers.

Heat is a factor, though, in a good number of those that do occur. Sevaral servlce fecilities report a rush of service calls at the start of every heat wava. The general rule of thumb appears to be that if you're comfortable, tha machine and its alectronlc components will be too. —*L.H.*

IBM's Dealer Response Program, which is aimed at providing backup for tha reteil outlets, Briggs said, "The vast majority of calls we receive from our dealers is oriented toward software rether then toward hardware." Tha singla biggest aree of difficulties centers on applications and user problems in running software.

Avoiding Unpleasant Surprises

Even with these things to think about, many users dafinitely cen do without a contract. But, if you don't have one, do you bave the cash to lay out if something happens? "When you hava e contract," said Charles Morgan, servica managar at Datel, an authorized New York City PC dealer, "there are no surprises in case of a breakdown. You can budgat yoursalf and know you'll stick to it." Detel hed its own reminder of this recantly when it facad a $1,400 bill to fix a Diablo printar it uses for displeys. "A sarvica contract would hava cost $35 e month," Morgan said.

So it's possible to ley out more for e repair than you would have peid for a contract, dapending on parts, time, and whare you have the work done. IBM's hourly rate for noncontract service is $96 with a 7/10-of-an-hour minimum, plus parts. Perhaps trying to sell us on a contrect, an IBM service representativa astimated that an average bill could run around $200. Sorbus, which cbarges flat rates for noncontract jobs, was quoting $279 to fix a system board as of July. According to Puccini, the system board costs the most to fix if you don't hava a contrect, but it's also the least likely to fail. Realigning a disk driva would cost $75, and othar repeirs on a 320K drive, $180.

Contract prica scbedules vary. Most service providers have bighly flexible options and a range of prices to accommodata different system configuretions and user needs. "There's no typical PC user," Briggs said. The variaty of sarvice contract options from IBM and its daalers allows users to pick and choose what's best for them, and perhaps cover only thosa items most likely to have problems.

A candidate here would be the printer, where usage causes mechanical wear and failures. It's also ona piace in which tha cost of contrects, depending on the model, may be relatively low compared with the cost of repair. A contract from Sorbus on the Epson MX100 matrix-printer would run $15 a month for on-site or $108 e year for carry-in—on the letter-quality Diablo 630 it would cost $36 a month for on-site, $264 e year for carry-in.

Unlike IBM, Sorbus has a month-by-month option, which gives users the freedom to decide on a month-to-month basis if thay want to continue coverage. On a basic IBM 64K unit with two drivas and a monitor, the Sorbus contract, as of July, would cost $300 a year for carry-in, $34 a month for on-sita. Ovarell, Sorbus offers its customers their choice of on-site, pick-up, mail-in (20 locetions), end carry-in. The on-site option is availabla in virtually ell locations in the United States. There is no test required before Sorbus issues a contract. For machine ownars who prefer to do without a contract, Sorbus accapts units carriad in or shipped on e per-incident basis.

IBM Expanding Service

IBM itself is in tha procass of expanding its service natwork. Thare are now more than 100 Service/Exchange Centars to handle carry-in repairs. Pick-up/delivery service is eveileble within distances of 30 to 100 miles from the centers (you'll have to check with IBM on your specific location). On-site service is also provided, but on e more limited basis than is offered by Sorbus (IBM defines on-slte service evailebility by zip coda.) Mail-in service is now evelleble through seven Regional Repair Centers.

USERS CAN pick and choose what's best for them, and perhaps cover only those items most likely to have problems.

In addition to the carry-in or mail-in options available during the 90-dey warranty, IBM offers PC owners elther a 9-month warranty extension term wlth carry-ln, peck-up/delivery, or on-slte servica, or an annuel-term contract thet edds e meil-in option to these choices. There's a contrect price for just about anyone's budget. Tbe system unit with no drives, for example, can be covered for on-site service for the 9-month warranty extension contract for $145; on-site for the 12-month annual term would be $165. Choosing the mail-in option on the annual term would cost $92.50. The 9-month extenslon for the XT system unit would run $575 for on-site; the ennuel term would cost $853. Mail-in annual coverage ls $367.

Choosing to place contract coverage with IBM wbila your machine is still under warranty will seve you the lnspection IBM otherwise requires before issuing e service contract, along with the $96 an hour (4/10-of-an-bour minimum) lt costs. If you opt for on-site or pick-up delivery extension wblle your machine ls still under warranty, those options will be evaileble to you during the warranty period as well.

IBM handles virtually all failures on an FRU basis, replecing the problem unit with e working one. If you request repair (availeble on a mail-in basis end on carry-ln for certaln products in certain locations), you should be prepared for extra charges.

Some Useful Service Numbers

No matter where you live in the United States, IBM and Sorbus have a number to call when your computer needs help.

Both IBM and Sorbus maintain 800 numbers for making service arrangaments. For IBM, lt's (800) 428-2569. If you're in Hawali, Alaska, or Guam, call collect to (312) 966-7451. For Sorbus, call (800) 423-2797 ln California (213) 841-1973.

Tbe Associatlon of Better Computer Dealars (ABCD) is an organization of some 75 dealersbips in 24 states. Included in its charter is a provision that every member will service a machine bought at another member's store. The Association is based in Lexington, Kentucky, and can be reeched at (606) 223-3804. —*L.H.*

The Dealers

Authorized IBM dealers, under the terms of their contracts, do not heve to service out-of-warranty machines unless the customer bought them et the store. You'll find a very mixed bag, es most PC owners know, in looking for service from the various stores. Datel in New York, for example, will help out any PC owner who needs help. "I don't heve to service customers unless they bought from me," Morgan said. "But I will work with them—that's my choice."

In common with a growing number of other IBM deelerships, Detel participetes in the Dealer Service Option program, designed by IBM as an extension to the warranty. IBM sells the program to its deelers, who then sell it to their customers for 9- or 12-month terms, covering whetever parts of the system the PC owner wents. It's entirely up to the dealer to decide the level of post-warranty coverage.

In eddition to the Dealer Service Option, some stores set up their own service programs, while others mey work entirely on an hourly basis. Other stores may elect to provide no service et all.

Do It Yourself?

If sorting out ell the possibilities is too complicated or boring, and if you're technically adept, you mey try the go-it-elone route. With the mechine's diagnostics and the technical manuals available from IBM, this is certeinly possible for a good deel of troubleshooting. But on e prectical level, do you want to take a chance on soldering in e new chip and possibly ruining e board?

There are other stumbling blocks as well. We know some more than willing do-it-yourselfers who complein that with all the menuals end diagnostics, they still can't get enough informetion to track down their bugs and glitches. "It keeps telling me there's something wrong with the printer, but it won't tell me what," said one frustrated PC user.

And while hard-memory errors are pretty easy to find, the source of soft-memory problems can be difficult to track down, as noted by another PC user. "The address flashes on the screen for only e tenth of e second, and what if you're not looking at that moment?" he said. "There are 27 plug-in chips on the board. I can do the replecement for $5, but how do I know which chip it is?"

Actually, no metter what course you think you'll follow, it's probably a good idee to think about service when you're buying your computer. It's worth knowing, for example, thet however you repair it, the XT will cost more then the PC, and thet some printers ere more expensive to meintain than others. At least by giving repeir and maintenance some thought before the fact, you'll be better prepared when the time comes to service your PC.

/PC

THE important thing is not that a contract will cost, say, $300 a year. It's what will it cost not to have it."

PC Abroad

Some facts you should know about service overseas.

Moving overseas? Your IBM service contract can't move with you, and Sorbus doesn't operate outside the United Stetes. You may have some luck with the ComputerLand Passport Program, a service contract that is honored by any ComputerLand outlet, anywhere in the world. PC service outside the United States is limited for both corporate and equipment reasons. If you're in a country where IBM has an office, you can probably arrange for some kind of backup, but it will vary greetly from place to place. Keep in mind, too, thet your mechine will heve to be modified for use in most places outside the United States. *—L.H.*

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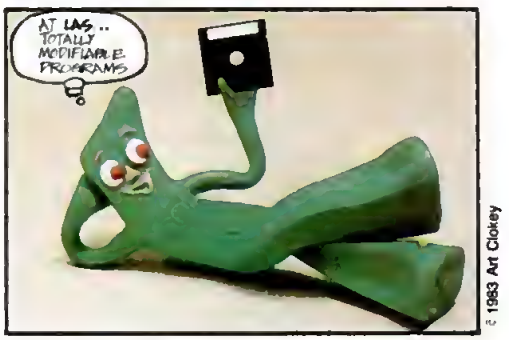
INTRODUCES



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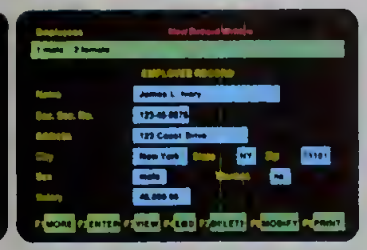

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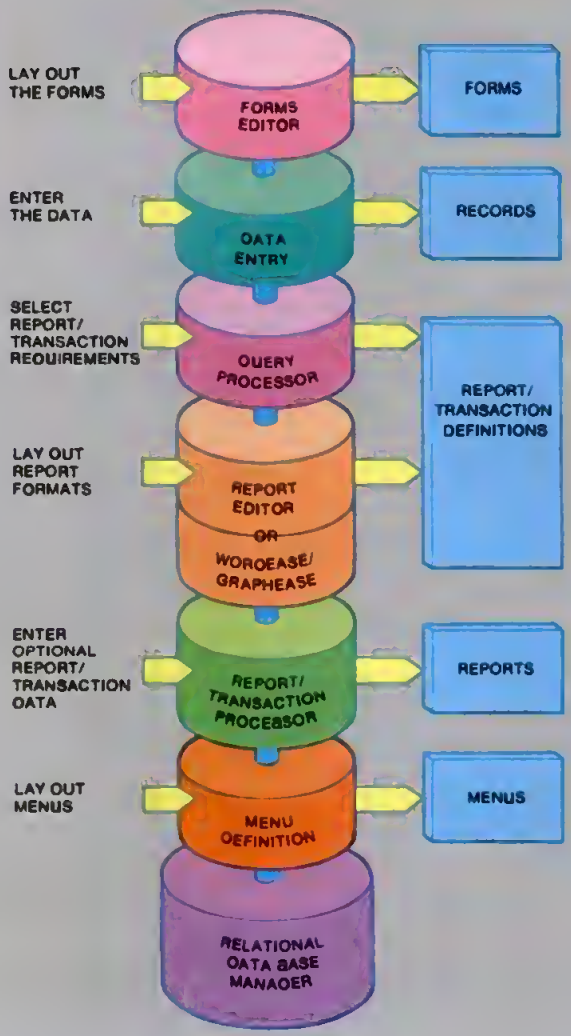

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CIRCLE 415 ON READER SERVICE CARD

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Think of it this way...

CIRCLE 143 ON READER SERVICE CARD

The Cygnet Communications CoSystem. It's the first in an entirely new category of products. Not only can the CoSystem draw on the full resources of the PC, it can also function independently to streamline a whole spectrum of telephony, information access and voice/data communication tasks. Tasks you can't accomplish with any other combination of hardware and software. At any price.

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The other half of your PC is here.

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Seeing is believing. And that's the only way you can fully appreciate the Cygnet CoSystem. Like a description of the axle's effect on the wheel, words can't fully communicate the CoSystem's value to the PC. A demonstration makes it startlingly clear. Visit your local computer store, and find out how your personal computer can add a whole new dimension to your personal productivity. All it takes is the Other Half of Your PC.

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ON THE ROAD WITH A TRAVELING COMPUTER REPAIRPERSON

When a Sorbus field engineer calls in for daily assignments, he must be prepared for anything from simple preventive maintenance to a complete system crash.

"There's smoke coming out of the CPU! Should I turn it off?"

These and other questions are the bread and butter of this culture's version of the traveling tinker, the computer repairperson. Combining the powers of a psychic with the equanimity of a crisis-line counselor, the men and women who repair computers can only predict that their working days will be unpredictable.

Almost any situation might be encountered on the other end of the line when a repairperson calls in at 8:15 a.m. for the morning lineup: a blank day promising nothing but paperwork and parts inventory, six urgent calls from companies whose systems have crashed, or a simple request for preventive maintenance.

Management Assistance

To get a better understanding of the computer repairperson's daily "routine," I visited the San Leandro, California offices of Sorbus Service, Division of Management Assistance, Inc. (MAI), one of the nation's largest third-party computer maintenance companies. Sorbus services microcomputers, terminals, and large systems for a variety of users. Micro owners

Illustration: Julian Graddon

can either bring their ailing machines to the repair depot, bave their machines picked up, or (wbat luxury) have a repairperson dispatched to the work site. About 17 percent of Sorbus' present work load comes from microcomputers, and this percentage is increasing.

A computer repairperson, called a "field engineer" at Sorbus, needs to comprebend more than just the innards of a wide variety of machines, though every engineer muat have a detailed knowledge of at least one system, as well as working familiarity with a host of others.

The pace can get bectic, and the pressure can be extreme. In fact, experience and calmness under fire are often as valuable as technical expertise, according to Harry Farrell, districl director for Sorbua in the northwest United States. "With a more relaxed engineer," Farreil said, "it may take 10 minutes more to get something fixed, but it will get fixed."

An engineer must also maintain a flexible attitude. His biggest challenge for the day may be a customer calling In to remind the engineer, "You promised you'd come in here and look at a few minor problems." Another client may want the engineer to upgrade a ayatem or phase out old equipment. At atill another site, an entire system may be completely down.

When those especially hectic days arise, said field engineer Howard Godfrey, the first thing to do after talking witb the dispatcher is to call the customers directly and hear the problems in their own words. They may be able to explain specifics under detailed questioning, and sometimes, if their workload permits, they may be able to wait a few hours for an engineer to arrive.

Sometimes the difficulty is a simple electrical problem. "We've gotten customers up just by having them check their circuit boxes," Godfrey said. After determining which of the "urgent" calls is most urgent, the engineer can aim his car in the right direction.

Once at the job site, the repair work uaually entails more than attacking logic cards with oscilloscope and acrewdriver. As Godfrey noted, "Public relations is half the job." This is difficult sometimes, when an engineer goes out to a yacht club where the keyboard doesn't work, and someone abashedly says, "Well, we had a party last week and someone spilled a glass of champagne . . ."

Field engineer Ed Fuentes concurred, as he drove to a service call at the offices of a regular customer, "You've got to have great patience, and you have to be a kind of psychologist. Sometimes people get really nasty. Sometimes they come up to you and tell you all their problems."

The variety of mechanical problems Fuentes has to deal with became clear when he opened the trunk of his car; memory boards, logic board, oscilloscope, toola, and manuaia filled it almost completely. "I try to take as much with me as i can," he said.

Fuentes was scheduled to remove a disk drive and install a newer model at the company. Inside, he greeted people with the ease of long association. They talked about adding a new jumper cable to an 8-way board. Fuentes, unfazed, asks for a soldering iron and a piece of wire, and soon has the new cable in place. Fuentes often finds that while he may be called in to fix one problem, several others may have cropped up by the time he arrives.

Attitudes vary from customer to customer as to how much service fills the bill. Some people think that you should visit them once a month because they pay their bills once a month, noted one engineer. "People will get their invoicea and suddenly they'll call." He recalled one case where he would regularly hear from a company and go in to find that, for instance, a set screw on a machine would be loose in a way impossible to account for in normal daily usage. He would fix it with a smiie.

Ridin' Fence

Sorbus' district in the Greater San Francisco Bay area, including Sacramento, relies on approximately 60 field engineers. Some work so far out in their territories that they become technological cowboya, mending fence in far flung corners of the ranch. All the engineers I spoke to commented on the relative freedom of their work, which combined travel, variety, and the perks of a regular eight-to-five stint. "I just come in once a week to turn in defective parts," says field engineer Marty Miller. "Otherwise I just call in for my assignments."

Miller displayed some of the parts he'd collected that week, giving a running commentary on the week's problems. "Here's a tape drive cartridge that kept giving Error 5s—a communications error, indicating that the tape drive won't read. If there were disk drives hooked into this

THE MEN and women who repair computers can only predict that their working days will be unpredictable.

disk drive controller, the computer wouldn't think the disk drives were up to speed.

"Here's a keyboard with e 3 key thet won't work. Usually it's just dirty contacts, end I can cleen them, but not this time." He pulls out a monitor. "This one shrinks and shakes."

A typical day for him consists of approximately equal time on preventive maintenance and trouble shooting, Miller said. He showed a handwritten list of the more than 25 companies whose equipment he serviced and maintained regularly. "Some customers like to have a scheduled appointment, usually the high-volume places."

"To the customer, a prohlem is a comhination of dollar outlay and down time. This (the repair service) is their insurance policy," aaid Godfrey. The eim of a computer repairperson is to give that kind of insurance to all the users, from micro users in the home to peyroll clerks who want to squeeze the payroll checks out of their big mainframe system.

Some problems are relatively simple, a cleer-cut metter of finding the defective part. Godfrey described the process of repairing a recalcitrant printer: "The printer was just stopping, wouldn't do anything. First I checked the feed mechanism—that seemed okay, after I mede some adjustments. Then I tested the power supply, looked at the cabling to see if anything was loose or chafing. It still failed.

"Nothing changed until I got to the interlock switch. Then I drove the interlock switch down as hard as possible with my finger. It worked for a moment. I metered the switch out, and then I saw that the contacts were corroded on the outside, which indicated that it also might be corroding internally."

To solve the prohlem temporarily, Godfrey wired the switch together so that it could still function until e new part arrived. "This wes only after 20 minutes or so of testing it, showing the customers that it would work." After e repair joh is complete, you usually want to do some follow-up, Godfrey said. For the switch problem, he promised to call back the next day and see how it was working. They might be pushing down the switch too hard.

But tracing down the reai problem in a system is what tests the fieid engineer's

Mix And Match: Sorbus Takes On The Micros

The vast Sorbus network extends its services to the microcomputer industry.

Understandably, most microcomputer buyers are concerned about the level of aupport they can expect in case of machine breakdowns. "What if. . . ?" is a major bugaboo in their minds, even when all is well with their mechines. "How much. . . ?" and "How long. . . ?" are close competitors for their anxieties.

Dealers are also on the apot in regard to support. Their primary commitment is selling equipment, hut their customers often hold them reaponsible when they run into service snags.

Sorbus Service Division of Management Assistance, Inc. (MAI) has stepped into the breach, offering succor to both parties. The parent company, MAI is known primarily as the manufacturer and marketer of Basic FourR information processing aystems. It is also one of the top third-party maintenance companies in this country, primarily through its Sorbus Service Division.

Sorbus announced In July a new maintenance agreement available for buyers (or owners) of microcomputers and related peripberals through their dealers. For the dealer, the benefits are ohvious. He can concentrate on selling his hardware, offering his customers the assurance of a full service agreement from the industry leader. The dealer is liberated from the onerous chores of shipping defective units back to manufacturera for repair or replacement or of maintaining parts inventories. He no longer has to train technical personnel, stock diagnostic equipment, or act as middleman and complaint bureau on repairs.

The micro owner is plugged into the vast Sorbus Service network: 1,400 technical support personnel working out of 165 locations nationwide. The Sorbus Field Inventory System controls more than 100,000 parts numbers in 3,000 locations coast to coast.

Another key advantage for the micro owner: Sorbus can service mixed-vendor systems and most major brands of microcomputers and peripberals as well as equipment manufactured by Diablo, Basic FourR, Soroc, Kaypro, NEC, North Star, Texas Instruments, Epson, Okidata, Zilog, Hazeltine, TeleVideo, Data South, Visual Technology, Liberty Electronics, and Dynahyte.

In addition to on-site maintenance, the company offers a national network of repair depots and Sorbus Stations, which operate a 24-hour "carry-in" service.

I talked hriefly with Walter Rodefeld, field manager for the New York City area, wbo gave me some reassuring news for PC owners. A dealer can sell you a service contract wbether or not you bought your machine from bim. (You can also buy the service directly from Sorbus.) Good news indeed for those wbo ordered PCs hy mail or adulterated your system with non-IBM components that need attention.

John Puccini, manager of new products and services, says that Sorbus has been laying the groundwork for the micro maintenance service for 2 to 3 years. It wanted to "work out the wrinkles" before going public. "But," ba added, "the service is in place, and we've already signed hundreds of dealers." He expects that "in 3 to 4 years, micros will account for 20 percent of our total revenue—somewbere in tbe $40- to $50-million range."

Marvin Venahle, vice president of marketing for Sorbus, says, "Our dealer program represents a major step in our commitment to provide servicing support for the microcomputer market. We have the Incentivea for the dealers and the benefits for his customers."

Micro owners can get more informatlon from their dealers or from communications manager Dick Packert at (215) 296-6284. Dealers can contact Sorhus at (800) 423-2797 for details.

—*Katherine Herrick*

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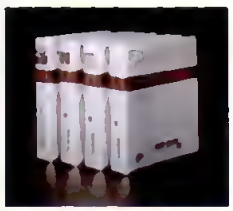

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CIRCLE 185 ON READER SERVICE CARD

mettle. Is the problem in the machine, in the operators, or even (gasp) in the outside world?

Godfrey described one of his more irksome calls. "At one company, the CPU and drives wouldn't turn on. By the time I showed up, the whole computer was down. I replaced a fuse and the machine just started acting crazy. I eventually picked up a 45-amp-power supply from the office and after I installed it, the system worked fine."

But strangely enough, another customer nearby owned a similar system and registered the same complaints. "The same

FUENTES opened the trunk of his car; memory boards, logic board, oscilloscope, tools, and manuals filled it almost completely.

fuse blew," recalled Godfrey. "We replaced the fuse and the machine started acting crazy in the same way, with lights flashing and blinking in random patterns. I asked myself, "Did I create this problem, or did it create itself?" After repairing the second client's computer with the office's last 45-amp power supply, Godfrey learned that there had been a power surge in the area that had affected both computers.

Miller said that intermittent problems were his biggest hassle. "You know, you come in, and the operator will swear up and down that it failed. You run all the diagnostics you can: nothing." But after working with a system for a while, he said, you get to know a machine's quirks. You might hear a squeaking noise and know intuitively that the computer's drive motor is burning out.

In short, for the field engineer, familiarity with each system offers the key to effective maintenance. But without a good diskside manner, all the technical knowledge in the territory might count for naught. /PC

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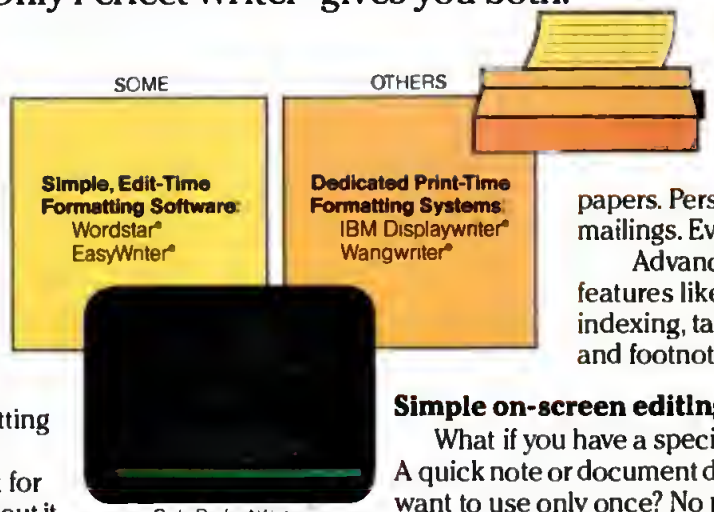

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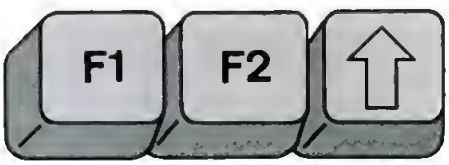

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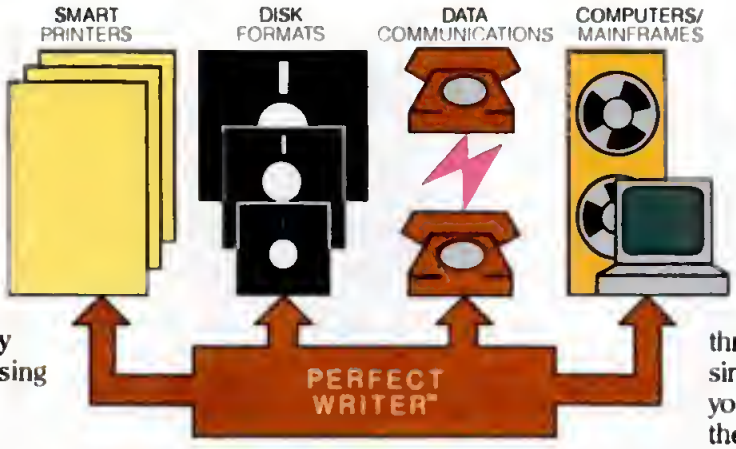

Perfect Writer™ is the most compatible word processing program.

Everything you compose with Perfect Writer™—every chart, every table, every document, everything—can be used by virtually any other word processing program or dedicated system.

That's because Perfect Writer™ uses true ASCII data files to store your documents. ASCII is the computer industry's standard information code. It's read and recognized by computer systems worldwide, regardless of disk format or size, whether it's used locally or sent over telephone lines.

Spreadsheets can be included.

Want to illustrate your Perfect Writer™ document with a financial table or graph that's stored in a Perfect Calc™ spreadsheet? You can—easily. In fact, you can even edit the numbers for your Perfect Writer™ document without disturbing the original Perfect Calc™ spreadsheet. That's Perfect Software's™ fully integrated programs at work.

Split screen editing.

You can view and edit two documents on the screen at the same time with Perfect Writer's™ unique split screen feature. One simple command moves you easily between documents. And you can even review a spreadsheet while editing up to six other documents! It makes the preparation of complex documents easier than ever before.

Check your spelling as you write with Perfect Speller.™

Perfect Speller's™ in-text spelling checker finds spelling errors and typos at a rate of 4,000 words per minute. (That's 20 pages every three minutes!) Then, at a single command from you, Perfect Speller™ lists the misspelled words or marks errors in the text of your document.

Self-teaching software makes it easy.

Perfect Writer's™ document design tutorials are matched to the easy-to-read user guide. Eight lessons are included. Learn how to handle form letters, how to write business correspondence, and how to create your own special spelling dictionary. All tutorials are software-based, interactive programs to make learning easy and fun.

Available for all IBM-PC DOS,® CP/M,® and MS-DOS® operating systems.

When you upgrade to new hardware, Perfect Writer™ keeps right on working. All text files are transferable. No other software works with a wider range of personal computers. In fact, Perfect Software,™ now available for all of the most popular 8- and 16-bit computers, will soon be available for 32-bit formats as well.

Only Perfect Writer™ offers you this much flexibility. Write your own success story today. With Perfect Writer.™

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plus multiple w

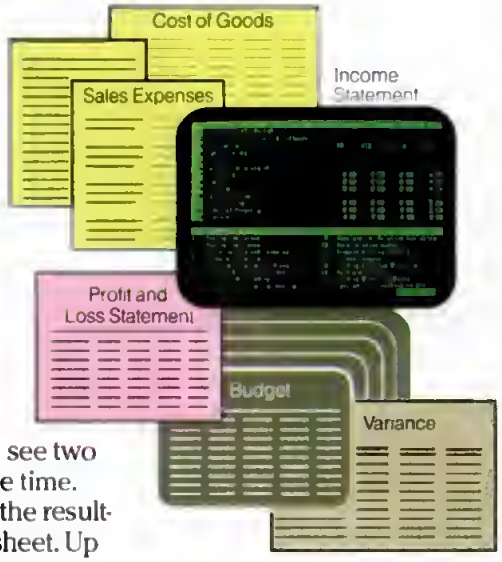
For successful solutions in financial planning.

Perfect Calc™ makes it easy.

Perfect Calc™ gives you the financial planning and analysis tools for success. Automatic associated spreadsheets. Built-in accounting and financial tools. Easy commands.

And only Perfect Calc™ features on-line associated spreadsheets plus split-window display.

With Perfect Calc's™ multiple window display, you can see two different spreadsheets at the same time. Change your figures and see how the resulting variations affect each spreadsheet. Up to seven spreadsheets on-line at once.



Multiple Spreadsheets

Associated spreadsheets
AUTOMATIC:

No double work—use any information you choose simply by referring to other spreadsheets. Move information, formulas or whole spreadsheets freely between multiple spreadsheets. Permits fill-in-the-blanks automatic forecasting and planning. Sixteen built-in application programs are included.

Spreadsheet consolidation
MANUAL:

Simple cut-and-paste spreadsheet entries. Line, column, or whole spreadsheet additions from any one of seven on-line spreadsheets are also easy with Perfect Calc.™

Only Perfect Calc™ does both!

How Perfect Calc's™ muitipie file association really pays off.

A good example is the built-in Income Statement Program. The income spreadsheet automatically reads from three other spreadsheets: Cost of Goods Statement, General and Administrative Expenses Statement, and Sales Expenses. All four are on-line simultaneously. All you do is fill in the blanks.

Then use all that information to perform an instant analysis and illustrate the results of potential budget cuts or increases. You change just one spreadsheet using the fill-in-the-blanks style. Perfect Calc™ automatically takes care of the rest.

Setting up the Perfect™ spreadsheet!

Entering titles, labels, and additional information on your spreadsheet is easy with Perfect Calc.™ It recognizes words automatically and handles them correctly without any special commands. If you want to use numbers—like dates—for item labels, that's easy, too.

Individually variable column widths add flexibility in setting up your Perfect Calc™ spreadsheet. And once you've developed one spreadsheet, you can use it as a template for other applications. Simply refer to it.

Seif-teaching software.

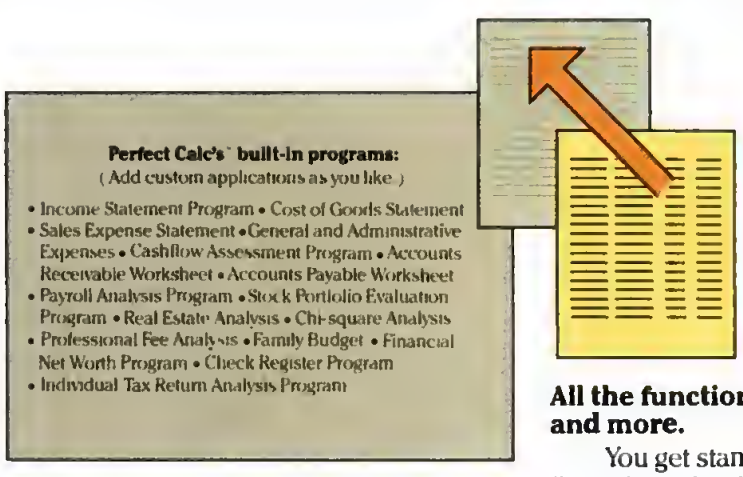
Easy, software-based lessons are included to make learning spreadsheet techniques simple. The lessons are matched to guides in the user manuals so

t Calc™

ated spreadsheets
indow display.

Sixteen applications built in. And that's only the beginning.

you can follow along in the text. Because you learn on the computer at your own pace, there's no pressure to perform. Try new applications when you are ready.



The most complete applications.

Perfect Calc™ is the only spreadsheet you can buy with 16 applications built in. Standard paper and pencil financial tools are ready to use. All you do is fill in the blanks.

Just a simple command is all you need to start working. And on-screen tutorials and English prompts give you assistance whenever you need it.

Handy cursor commands.

You can move the cursor easily to the top of a column, beginning or end of a line, to the page before or after—with a single command.

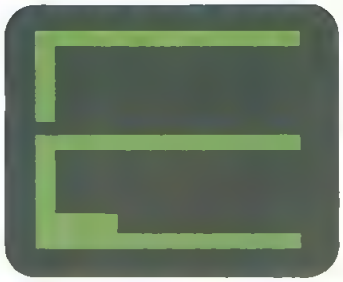
And you can go back and forth between two spreadsheets on split screen display with just as much ease. That makes multiple spreadsheet handling easier than ever before.

The most compatible spreadsheets.

Perfect Calc™ data is stored in true ASCII files—the files read and recognized by every computer system. So, it's simple to use a Perfect Calc™ spreadsheet in a Perfect Writer™ report or letter. Or, build graphic displays using the information in one of your spreadsheets.

All the functions you need—and more.

You get standard functions for financial, scientific, and engineering applications plus an expandable functions library which allows you to add new formulas as you like. Write your own complex applications programs. Just use a Perfect Calc™ spreadsheet and take advantage of the powerful associated files feature.



Put the solutions for success to work for you.

Using simple plain-English prompts and on-line references, you can do sophisticated forecasting and planning in minutes.

Automatic associated spreadsheet information management. Standard spreadsheet calculation and consolidation. Only Perfect Calc™ gives you both.

Start planning for success today with Perfect Calc.™

Perfect Software, Inc.
Solutions for success

CIRCLE 314 ON READER SERVICE CARD

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For successful manag

The powerful records management solution for the personal computer user.

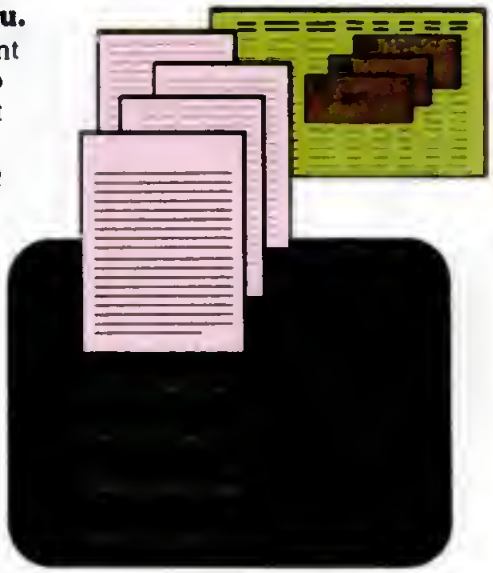
Put information to work for you.

Most information management systems are either too small or too difficult to use. Now there's Perfect Filer,™ the executive information management system that's easy to use. You can keep track of mailing lists, clients, sales, merchandise, names and addresses, and much more.

Easy to get started.

Two ready-to-use data entry forms are provided so that you can begin using Perfect Filer™ immediately. One is for individuals, the other for companies and organizations. You type important information just once. Perfect Filer™ does the rest for you. No special training is required. In fact, your entire staff can use it.

On-line references and English prompts provide assistance when you have questions. And tutorials are included for improving your skills.



INSTANT DATA BASES AND REPORTS

Personalized form letters.

Use Perfect Filer™ together with Perfect Writer's™ word processing features to add a personal touch to mass mailing letters. You can even tag different groups within one mailing list so that your letters to them can include special paragraphs, subsections or operator-typed comments.

And Perfect Filer™ remembers nicknames, titles—even your special salutation for special clients or friends.

Generate mailing lists. Form letters. Specialized record-keeping forms and sorted lists. Choose from the two data entry forms provided or from seven data entry groups.

Information Management

Data entry forms
AUTOMATIC:
To create your own records file, just enter information on the convenient on-screen form. All of the parameters are predefined.

Information management
MANUAL:
Create custom data bases with ease. Build an entirely new structure, or "borrow" data entry groups from existing formats.

Only Perfect Filer™ offers you both!

Creating custom data bases has never been this automatic.

Single-keystroke data entry menus do the work for you. You enter your data just once on a blank Perfect Filer™ data entry form—whether it be client addresses, direct mail sorting codes, payment records inventory, or standing orders.

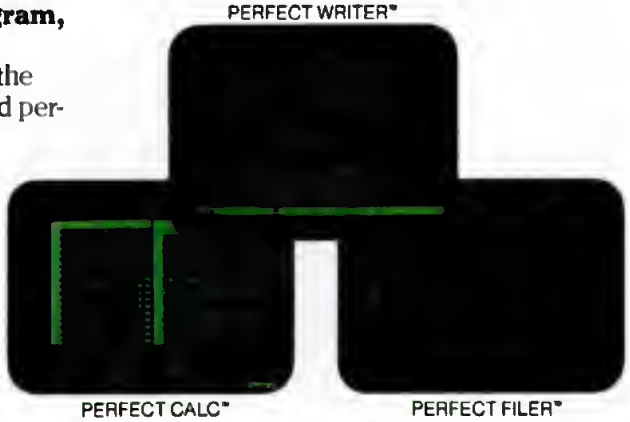
Successful information management. Perfect Filer™ makes it simple.

t Filer™
information ement.

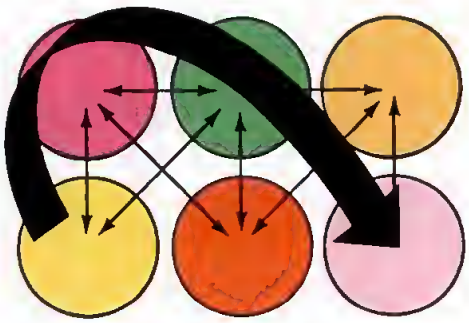
The integrated software solution.

When you learn one program, you've learned them all.

Perfect Software.™ All of the most-asked-for business and personal computer applications in one complete package. Word processing. Financial planning. Mail management. Records keeping. Perfect Software™ provides the solutions to those everyday business problems.



Each Perfect Software™ program works smoothly and efficiently with the others. All share common file structures. And, all use the same command configurations. So, learn one program and you can use them all.



Only Perfect Software™ offers you this much.

Perfect Software™ works with IBM-PC DOS,* CP/M,* and MS-DOS* operating systems as well as most 8- and 16-bit computers. And each Perfect Software™ program is power packed with extra-value features, including:

- Common control commands.
- Manual and automatic functions.
- Self-teaching software.

Solutions for success.

You get more performance, more flexibility and more automatic functions with Perfect Software™ than with conventional software packages. So, you save time and effort. And Perfect Software™ programs are self-teaching and fully interactive, for productivity plus convenience.

Perfect Calc™ provides unmatched spreadsheet performance. Perfect Filer™ is a records management powerhouse. Perfect Writer?™ Rated #1 by *Personal Computing*; given highest marks by *InfoWorld*; and called "the most comprehensive word processing package" by *Esquire Magazine.*

Perfect Software.™ Your solutions for success.

The Rebate. $160.00.

Now, for a limited time, personal computer users can get back $50 each on Perfect Writer™ and Perfect Calc.™ And, $30 each on Perfect Speller™ and Perfect Filer.™ That's $160 factory direct to you when you buy all four Perfect Software™ programs.*

Act now. Offer expires October 31, 1983.

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*Purchases made as a part of computer manufacturer's original equipment offer do not qualify. Void where restricted by law. See in-store display for details.

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Shown are IBM-PC* compatible programs. The Columbia MPC runs MS-DOS* plus six other operating systems.

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Distributors in Australia, Austria, Belgium, Colombia, Denmark, Hong Kong, Israel, Italy, Malaysia, Netherlands-Antilles, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, Venezuela.

Today, the Columbia MPC takes on hundreds of IBM-PC compatible software programs and IBM-PC add-ons or peripherals.

What's more, six other Columbia-supported operating systems are available—CP/M-80,* CP/M-86,* Concurrent CP/M-86,* MP/M-86* (OASIS-16* and XENIX* available soon)—stretching the Columbia MPC's software compatibility beyond any other personal computer.

Farther, faster, for for less.

The Columbia MPC is shipped with fully supported software that will save you $3,000. Included is the entire self-teaching Perfect Software™ family: Perfect Writer,™ a word processor; Perfect Speller,™ a 50,000 word dictionary; Perfect Filer,™ a data base manager; and Perfect Calc,™ a financial calculation system.

In addition you get MS-DOS, CP/M-86, Macro/86 Assembler, BASICA,* Asynchronous Communications Support, Diagnostics and the Columbia Tutor program. This means your Columbia MPC is up and running right out of the box. Space Commanders and Fast Graphs show off the Columbia MPC's full-color graphics.

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With a list price of $3,995—including 128K RAM, 640K in dual disk drives, 8 IBM-PC compatible expansion slots, 2 serial and 1 parallel I/O, IBM-PC compatible keyboard, and color graphics monitor controller—the Columbia MPC is ready to go. And a complete 12MB hard disk system lists for $5,995—software included! B/W or color monitors and printers optional.

Made in U.S.A.—supported worldwide.

All Columbia hardware and software are backed by the "Call for Columbia" national service program. So, call us or our distributor for the dealer nearest you—and start looking at the Columbia MPC. It'll show you a whole new world of performance and value.

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Thirty minutes with your new computer and Infoscope, and you can be showing off — entering information, sorting it, displaying it, putting it to work in ways you never dreamed possible.

Infoscope, a revolutionary new program for dynamic information management opens up the potential of the personal computer. It's usable and useful now, even for a beginner, but it'll never get in the way in the long run.

From the first minute you use it, you'll discover some very interesting applications. It comes with demonstration "scripts" and sample data so you can sit back and watch it do its stuff without doing a lot of tedious data entry.

Infoscope helps you create "Scopes" to display data — windows on the screen that grow, shrink, move around, and overlap, while showing you just the information you want to see.

As you work with it, Infoscope adapts to your level of expertise. Its "choice-driven" approach makes it easy for a new user to get up to speed, but it doesn't entangle an expert in a maze of menus he doesn't want to see.

In short, Infoscope is as simple or as complex as you want it to be, and it does virtually any information management chore you want it to do.

But you have to see it for yourself. Infoscope is available for most popular 16 bit microcomputer systems. Ask for a demonstration at your local computer store, or write us for details.

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If you think $1495 for a 10 Mbyte high quality hard disk is a good deal, then wait until your computer dealer tells you about our $695 25 Mbyte tape back-up.

The Pegasus 10 comes complete with all the software and hardware you need to start operations.

If you've outgrown the storage capabilities of your IBM PC or compatible computer but haven't grown into the giant pricetags on 10 Mbyte hard disk systems, you're in for a surprise.

The price on a complete 10 Mbyte system featuring the latest Shugart components just reached an all time low!

For the first time, just $1495 gets you everything you need to start working on your hard disk system:

- Top quality SA612 10 Mbyte (formatted) fixed hard disk (ST506 compatible)
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- One year warranty

What's the catch?

There is none. It's a simple matter of economics. Pegasus saw the growing need for mass storage, made a commitment to fill this need, purchased thousands of the finest quality hard disks, and is now passing the good deal along to you.

The only thing you may be missing in buying the Pegasus instead of the IBM XT expansion chassis is something you may not need in the first place: eight expansion slots, a communications card, three little initials, and an extra $2,000 out of your pocket.

What about support?

Pegasus and your dealer stand behind every Pegasus 10. If your unit requires maintenance anytime during the one year warranty, simply return it to your dealer for repair at no charge for parts or service.

But don't I need a tape backup?

We recommend it! That's why we're offering you the same great deal on a ¼" cartridge tape backup. We've watched other companies offer 10 Mbytes of storage and forget about the backup altogether. Our tape backup, which carries a 90 day warranty, retails for just $695 — a small price for over 25 Mbytes of formatted storage and lots of peace of mind.

Where can I buy a Pegasus 10 Mbyte system?

Pegasus systems are available only through dealers. So contact the dealer in your area who sells IBM PC or compatible computers. If he doesn't have Pegasus, chances are he'll carry it soon. Just ask him to call us. We will ship him your Pegasus 10 immediately.

Does Pegasus have larger storage systems?

Absolutely. 27, 65, and 140 Mbyte systems are soon available from Pegasus. And the best part is that they, too, are breaking new ground when it comes to pricing. If you've outgrown 10 Mbytes of storage, ask about the larger capacity units. All with the same top quality hardware and software and full one year warranty.

Shugert SA612 Hard Disk Specifications	Cipher 525-CT Tape Drive Specifications
12.95 Mbytes unformatted	32 Mbytes unformatted
10.416 Mbytes formatted	28 Mbytes, 1024 byte sectors
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16.2 msec access time track to track	Transfer rate (read/write) 500 Kbits/sec
92 msec access time average	78 ips streaming
345 tracks/inch	¼ inch tape cartridge (3M DC 60A)
Mean Time Between Failure: 11,500 power on hours	Standard floppy disk interface (SA450 or SA 850)

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DBPlus™

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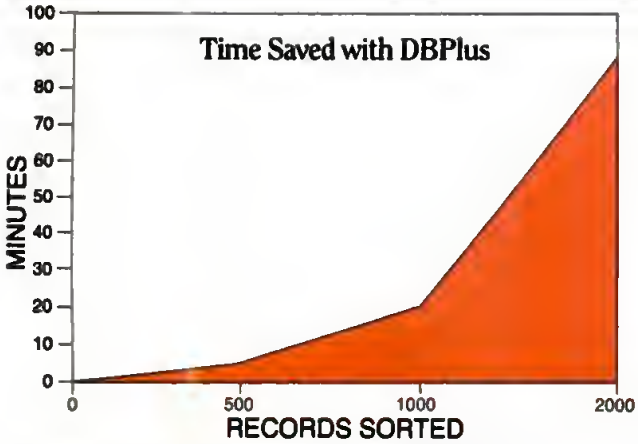

If you are serious about dBASE II™ you need DBPlus. This program runs outside of dBASE II™ and performs the following important functions on dBASE II™ data files:

- Sort
- Compress/Decompress
- Transform

DBPlus™ is designed to free you from the chore of typing or memorizing a new language. In most cases all you have to do is move the cursor to the next menu item and press return!

SORT

DBPlus™ can sort a data file up to 15 times faster than dBASE II™ on a single field; 32 fields may be sorted in a single pass and each additional field requires 1% more sorting time.

COMPRESS/DECOMPRESS

A copy of any dBASE II™ data file can be produced which is only 30% to 40% of the original size.

The compressed file will save you transmission time and phone costs when you send a data file over a modem.

Making backup copies of large data files can use up many floppy disks. Compressed files will save you space in archival storage.

TRANSFORM

You can now modify the structure of any data file by adding, deleting, and modifying fields without any programming knowledge.

DBPlus™ can also create a new file which is compatible with WordStar/MailMerge.™

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Manual and demo available.
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MARKETPLACE/VANESSA SCHNATMEIER

Before long the U.S. market for microcomputers will exceed the market for mainframes. According to industry seers, the dreaded shakeout has begun . . .

What Hath IBM Wrought?

The experts heve seen the future—and it belongs to the IBM PC. Companies that don't go elong with the IBM PC standard will eventuelly fell by the wayside or garner only modest profits.

Thet news, which should gledden the hearts of PC owners end PC-competible manufacturers, was the solid consensus of top industry observers et the Netionel Computer Conference panel on "The Personal Computer Industry: The Experts Forecast the Future."

Their figures end prognosticetions egreed thet if you own or plen to buy an IBM PC, you can relax in the knowledge that most of the computer industry will be trying to beet a path to your door.

If you're trying to one-up the PC, however, good luck. According to those observers, the era of the super-inventor and entrepreneur is fading. Now, they say, we're entering the epoch of the supermanegers, the supermarketeers, and planners who can teilor their compenies' PC-compatible products to vertical markets or win the war for shelf space et the computer specialty stores.

THE PERSONAL computer market will divide, as Gaul did, into three parts.

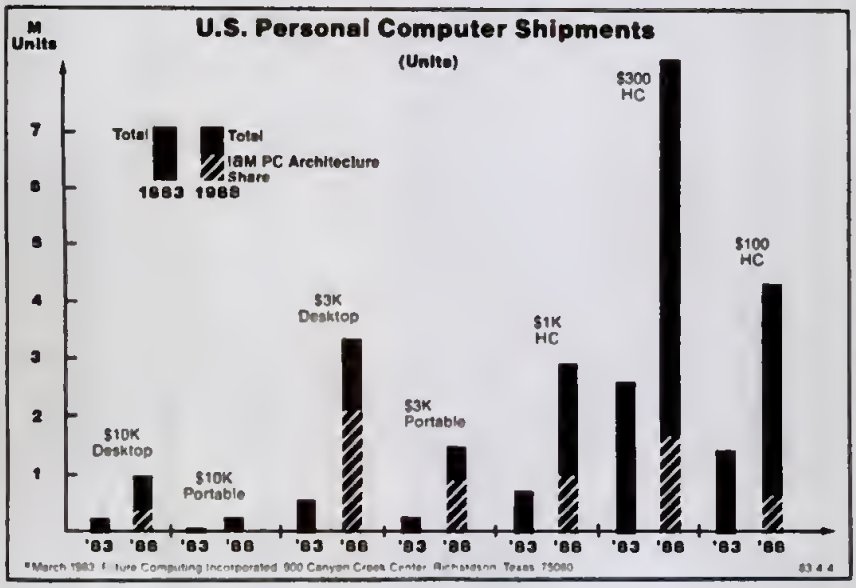
Personal Computers to the Fore

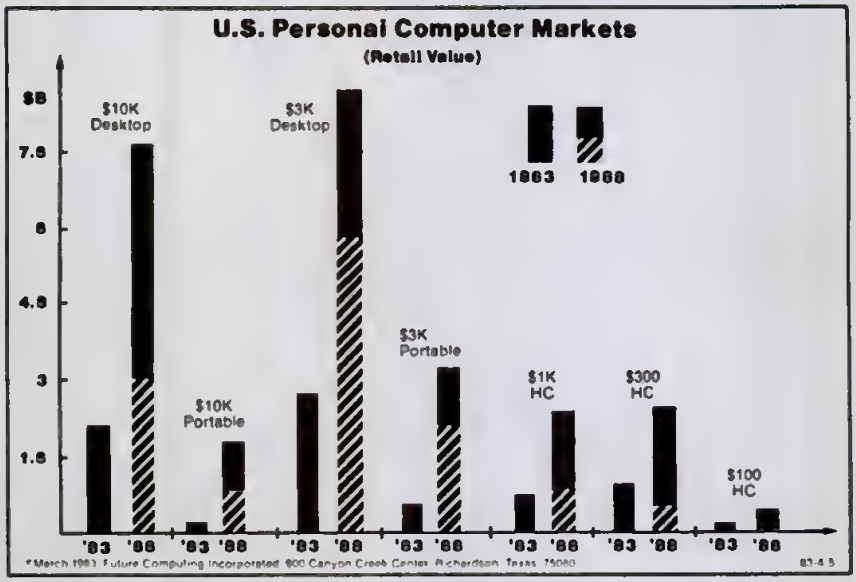
We need to realize that the personal computer industry is taking over the entire computer market, said the panel's cheir, Portia Isaacson, president end chief executive officer of Future Computing Incorporated, e market research firm that specielizes in the personal computer field. By next year, she said, the personel computer industry will surpass the minicomputer industry, and will top the mainfremes by 1986. The PC softwere market is elreedy larger then the mini software market, and by 1986 it also will overtake software for mainframes.

Needless to say, titanic emounts of money are at stake: this year, more than $10 billion in sales worldwide, with $7.5 billion coming from sales in the United States. Software for personal computers will be worth $2 billion in this country alone, and $8 billion internationally. Within 4 years these numbers will triple, predicted Egil Juliussen, Future Computing's chairman of the board: $35 billion for the world personal computer market (60

percent of that within the United States) and a world software market of $11 billion ($8 billion in the U.S.).

Evaryone wants to know, of course, which companies and businesses will get this money. Benjamin M. Rosen, of Rosen Research in New York, says that the personal computer market will divide, as Gaul did, into three parts: the IBM PC and others adhering to that architecture, Appla's future products, and averybody else. "Those not adhering to that standard, and those not named Apple, will have a tough row to hoe," says Rosen.





Future Computing's projections for unit sales and retail value of PC-compatibles shows $3K personal computers as the mainstream of the PC-compatible marketplace in terms of both units and retail values. Despite the small percentage of total units in the $10K (Winchester disk-based) category in 1988, they will account for nearly a third of the total retail value of shipments.

The shakeout is coming, stated Isaacson, and in some areas the crunch has already come. A wave of aggressive price-cutting by IBM and Apple is putting the squeeza on smaller companies like Vector Graphic and North Star, which are frantically slashing prices to remain competitive. Isaacson offered a glimmer of hope, however, for smaller fry. Though many companies will be edged out, 3 or 4 years from now, there will actually be more companies than exist today, and many of those will be start-ups.

Market Composition

The personal computer industry, with its two-pronged approach toward consumer and business users, resembles the consumer electronics market more than that of traditional minis or mainframes. A casual analyst might be confused by the multiplicity of distribution channels. Value-added resellers, direct sales from manufacturers, office product dealers, computer specialty stores, mail-order houses, and mass merchandisers all play a part.

The distribution channels differ widely in different prica categories. For the $10,000 hard-disk market, Isaacson astimated 1983 sales will be $2.4 billion at the end-user level. Of this amount, 31 percent will be sold direct from the manufacturer to the customer, 30 percent through value-added resellers, 8 percent through office products dealers, and 31 percent through computer specialty stores.

By 1988, Isaacson expects this market to increase to $9.7 billion, with computer specialty stores dispensing 45 percent of the hard-disk machines. Until recently the specialty shops and chains really had only one product to push: the Apple III. But, she said, with the emergence of the IBM-XT, the TI-Professional, and others, the picture will change.

Floppy disk products in tha $3,000 range will account for $3.3 billion dollars in retail sales this year. Machinas in this bracket, 58 percent of them to be sold in specialty stores, will account for $12 billion in 5 years. Computer specialty stores will only account for 50 percent of that $12 billion in 1988, largely because direct sales in that price bracket will rise from 9 percent in 1983 to 15 percent in 1988.

A Computer in Every Home?

Juliussen compared the current state of the burgeoning home and personal com-

putar market to the infancy of the black-and-white television market in the 1940s. "The black-and-white TV penetration of the American household went from zero to well over 50 percent in about 5 years. We're forecasting that the home computer will exhibit e very similar drametic growth. By 1988 or so, we expect that neerly 50 percent of American households will have at least ona home computer," said Juliussen.

BY 1988 OR SO, we expect that nearly 50 percent of American households will have at least one home computer.

The corporete insignia on thet computer at home is increesingly likely to be that of IBM or one of its plug-compatible minions, be edded. Market growth in PC-compatibles will top 30 percent this year, he predicted, though that growth will slow to a mere 13 percent by 1985, when most firms will have leapt on the Big Blue bandwagon.

Software for thase machines will rake in over $300 million this year, but this figure will rise to over $4 billion by 1985 because e PC-compatible machine requires eppropriate softwere. Though the largest increese—44 percent—will teke place in productivity software, Juliussen suggasted that entertainment software mey offer the best opportunities for new entries into the PC markat. As Isaacson emphasized, firms shouldn't ignore the dual motivation of buyers toward both enterteinment end business, no matter how business-oriented their epproach. (This assumes that a PC-compatible varsion of e "home computer" will be merketed shortly, a highly likely occurrence.)

The Shakeout Begins

What does this portend for fledgling computer firms trying to carve out their niche in an increasingly cutthroat marketplace? Wendell W. Jones II, business manager for the Western region of Arthur D. Little, Inc. had a few discouraging words for beginning businesses.

"There's more money aveilable than there are good deals," said Jones, "so a lot of start-ups are still being funded." But others, including the Fortune 1000 companies and the major deta processing firms, want a piece of that high return on investment (ROI); almost everyone one has a product geared to this industry.

As recently as 1981, ha said, being on tha technological cutting edge wes still critical for success. Price end performance questions were paramount. But now tha industry has shifted from the so-called embryonic stages, where almost everybody wes on the ground floor, to the growth stage, where the shakeout begins. The base technology is widely available and understood; today's businasses must tackle the new Entrepreneurial Age with finely honed markating strategies.

Today's opportunitias are structural, believes Jones, particularly in the chennels of distribution. Meil-order distribution opportunities have elreedy been snapped up, he said, and consolidation has begun in the retail sector; computer specialty stores and chains have stapped sure-footedly into this market segment, and opportunities are narrowing.

Technology can no longer give much of e foothold, says Jones. "The industry is no longer et a point where the bettar mousetrap meens more sales." Instead, ha exhorts, compenies should concentrate on plenning and marketing.

In short, computar firms should scrutinize thair position and product offarings with infinite care if they wish to survive. "Know thyself" is his advice. Successful firms don't fear adjusting to the needs of the marketplece; terminel compenies are becoming full-line microcomputer manufacturers and operating systems companies are moving into applications or targating vertical markets.

The PC Sets the Standard

Whetever ection e company takes toward improving its market position, it should keep in mind thet, within the world of the 16-bit personal computer for the single user, the IBM PC will set the pace. "It's a tidal weve," said Benjemin Rosen.

"To flow with the mainstream and be compatible with the 16-bit standard," he said "a naw product must be based on the 8088 microprocessor, must run on tha MS-DOS operating system, and must incorporate the IBM PC erchitecture." Rosen edded thet "to fight this stendard and not be Apple Computer means that your compeny will have modest success at best."

Another trend to keep in mind is the push for portability. Rosen compered the history of computar portebles to thet of calculators. Back in 1971, most calculetors ware dasktops. Now, howevar, 95 percant of calculators are portable, even though they mey never leava thair users' desks. "Portables are now tha fastest growing product type," he said, referring to computers. "If portability is eveileble et no functionel or monetary cost to tha user, it makes it herd to justify using an immobile, unwieldy eltarnative."

In software, MS-DOS has won the single-user 16-bit battle bands down. IBM end three score other systams worldwide rely on MS-DOS: "No other operating system is even close," says Rosen.

IN SOFTWARE, MS-DOS has won the single-user 16-bit battle hands down.

This ectually benefits the independent software vendors, who write virtually all the important software. These ISVs were forced to scetter their enargies over a variaty of machinas end proprietary systams in the 8-bit world. But with stenderdization, ISVs cen focus their efforts and maximize thair return on invastment. Also, stendardization lets ISVs write higher performance machine language, which requires less memory to write epplicetions, an important factor to consider when portability is being increasingly valued.

"Movement toward compatibility means thet more software will be available for the consumer, especially in essembly lenguege," said Rosen. Stand-alone productivity programs are giving way to integreted, ell-in-one packages. "When all the programs in a family hava common commands, it puts an end to time-consuming file transfers and disk-swapping," he

said.

The microcomputer industry is becoming more marketing driven and less technology-driven. "In the old deys you had the specs war, who had more bits or more bytes or more nanoseconds," Rosen said. "Today it's the battle for the hearts and the minds and the wellets of the customers."

One example is the way the mejor firms heve adopted celebrity spokespersons, such as Dick Cavett for Apple or the "Little Tramp" for IBM, to snare the imagination and interest of potential buyers. Advertising budgets total not mere millions, but tens of millions, as companies trumpet the message of the personal computer not only in the enthusiast megazines such es Byte but also in consumer magazines and TV commercials.

THE competition for remaining space will turn from frantic to ferocious.

Part of the reason for the refocusing of objectives is the influx of new chief executive officers (CEO) from less technical, more consumer-oriented industries. Rosen cited Osborne's new CEO, who hails from Consolidated Foods and Apple's new CEO from Pepsi-Cola Bottling Company as prime examples.

Once the consumer is hooked into examining e personal computer, he or she is most likely to buy it at a computer specialty store. Here the battle for shelf spece intensifies. Since most dealers can support only four or five brands, and two of those brands are probably IBM and Apple, the competition for remaining space will turn from frantic to ferocious. "Therefore," Rosen said, "it becomes crucial for firms to sell to the dealers first and give them all the hand-holding and support required, if they genuinely want a shot at the consumer market."

"But don't ignore the corporation in the quest for the casual user's dollars," warned Rosen. "Until recently," he said, "major corporetions eschewed the personel computer." Professionals who wanted them had to sneak them into the company on their expense eccounts. The result was e "Tower of Babel," a conglomeration of different brands thet couldn't communicate with each other or with their company's mainframes.

"But today," he said, "the Fortune 1000 companies have about-faced and are embracing the personal computer, buying in quantity to achieve economies of scale and to ensure that they will be able to coordinete them with their own mainframes. And what are they buying? Rosen quoted from e survey he had recently conducted in the metropolitan New York

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area: 85 percent of the major corporations surveyed had settled on the IBM PC.

The Keys to Success

Entering the personal computer market is easy in the short term but difficult in the long term. "One thing definitely not necessary for success is a Japanese name," Rosen stated. For several reasons, Japanese penetration of the U.S. personal computer market has been modest, even though 16 Japanese companies are currently competing for shelf space.

First, the Japanese market their products differently and have an incomplete understanding of the strategies that prove effective in the United States. The language barrier, and resulting software differences, further hinder Japanese entrants. Finally, the lack of standards in the eternally changing U.S. personal computer market left the Japanese without anything to build their own work around. But here's the rub: Now that the IBM PC has become the standard, the Japanese confusion will evaporate, and we should henceforth look for a stronger Japanese presence in the U.S. marketplace.

MARKETING shouldn't ignore either the all-important specialty store dealer or the corporate user.

To really succeed, predicted Rosen, a start-up company must first have extremely strong financial backing. Rosen, Juliussen, Isaacson, and Jones all concurred that the ere of the garage start-up is over; it now takes too much money to bankroll a company and ensure its foothold in the increasingly steep and slippery world of personal computers. The $7 million that Apple reaped during its first year of productions would be ludicrously small today.

Second, one must adhere to, or be compatible with, the 16-bit hardware and software standards. Third, a company should design a simple tripartite marketing strategy with enough "megabucks" to allow it to be heard above the noise of other campaigns; the marketing shouldn't ignore either the all-important specialty store dealer or the corporate user. Fourth, the product must fulfill a need. And finally, the company's management must be prepared to exploit the explosive growth inherent in the personal computer industry. But these qualities aren't common.

"If you know of a situation that meets the necessary conditions—a product needed in the market, compatibility with the 16-bit standard, this three-fold marketing approach, multimillion-dollar financing, and inspired management, please let me know after the session," quipped Rosen. */PC*

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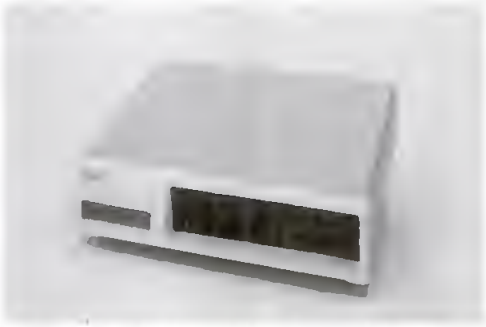

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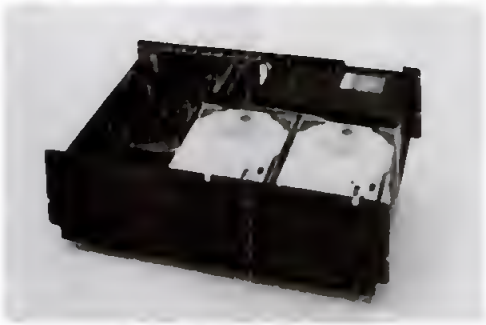

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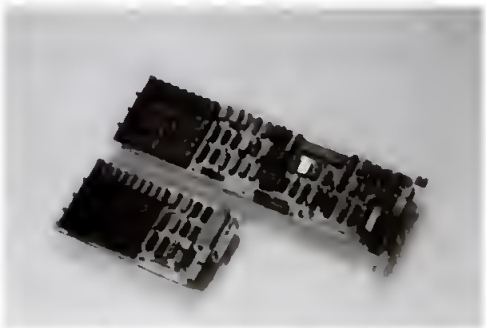

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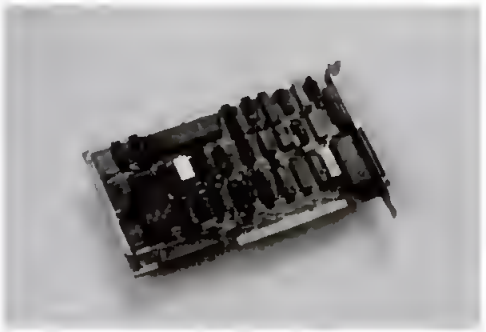

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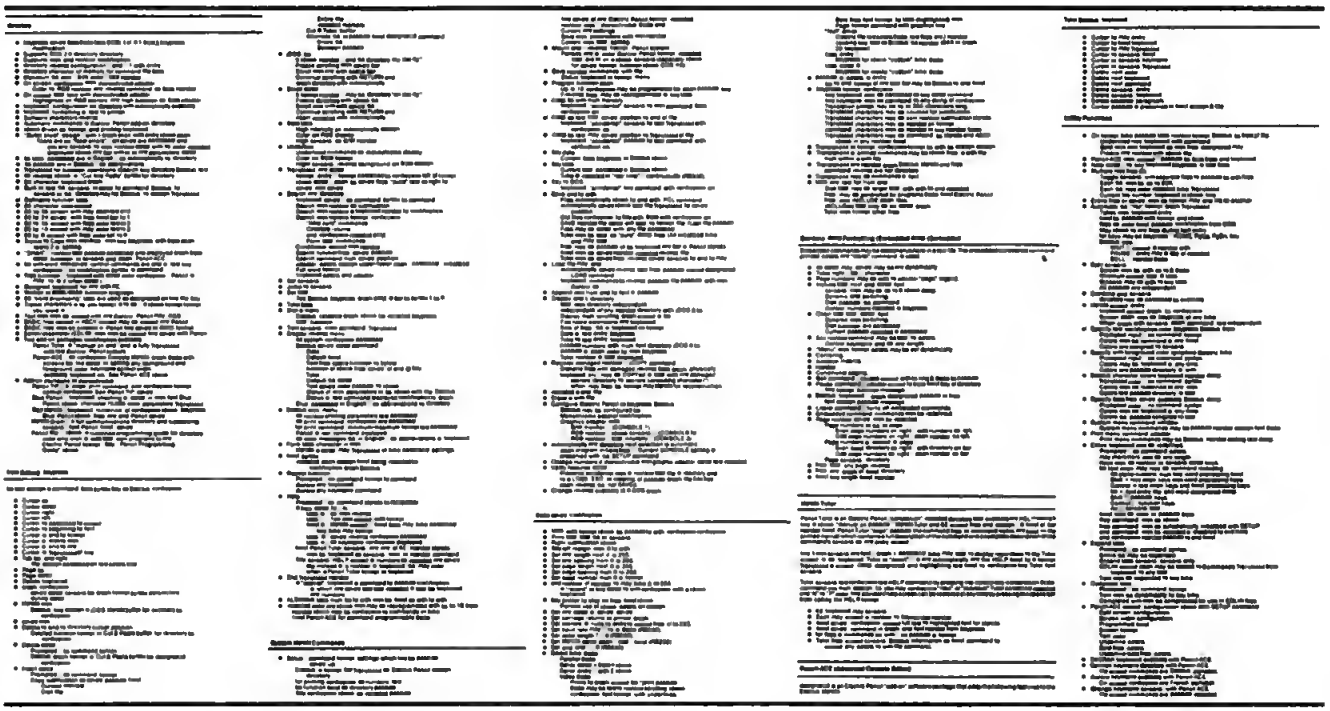

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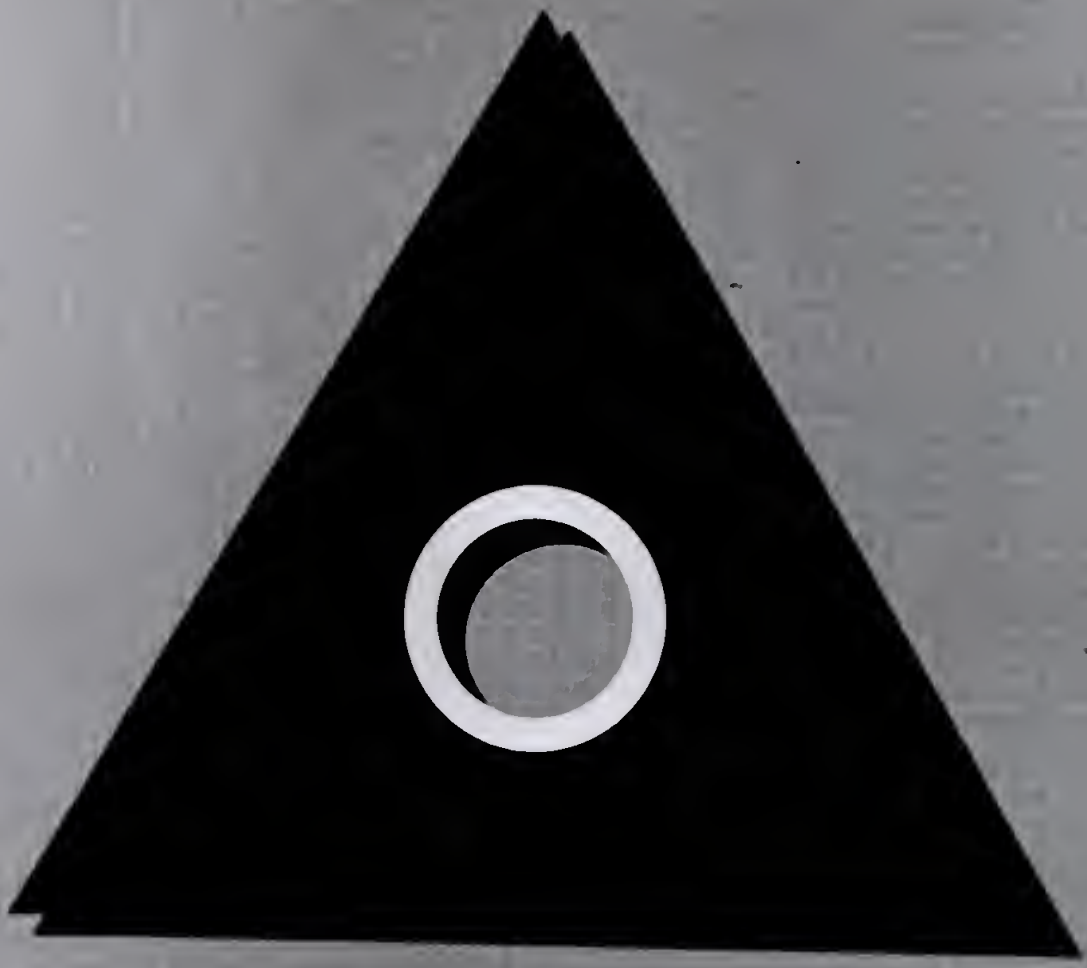

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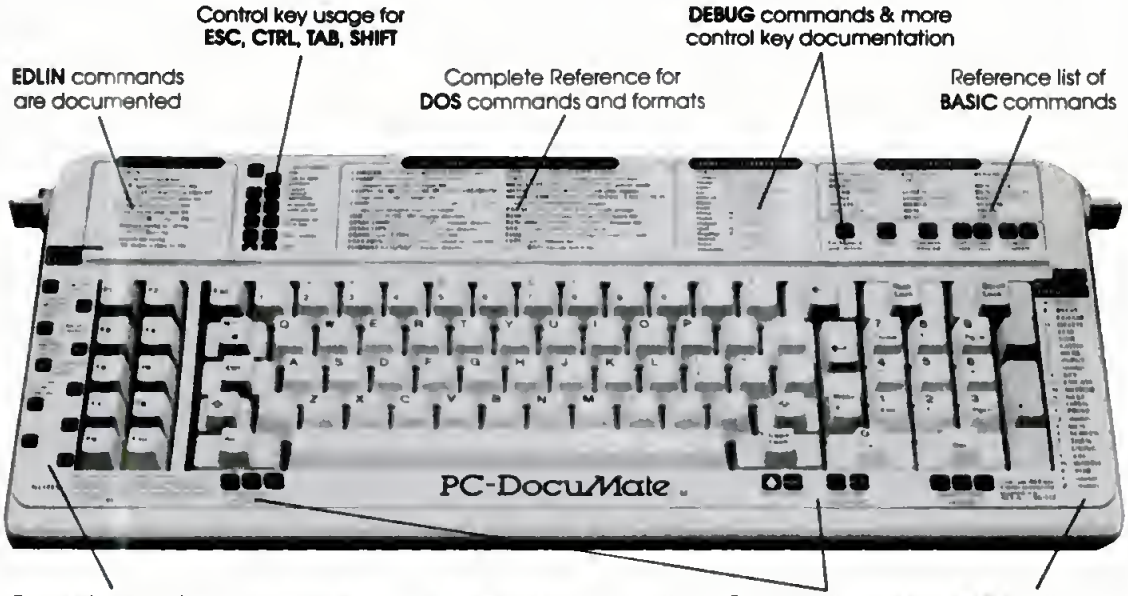

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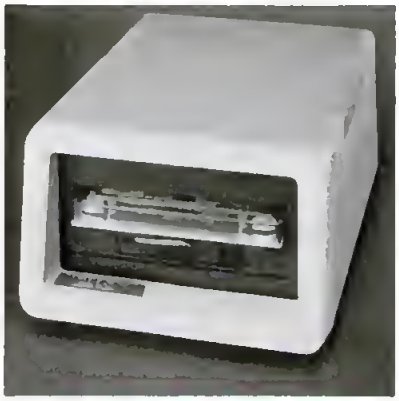

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HARDWARE/COREY SANDLER

You can get a big picture screen (57 lines long) for your PC if you can carry the big price tag that goes with it.

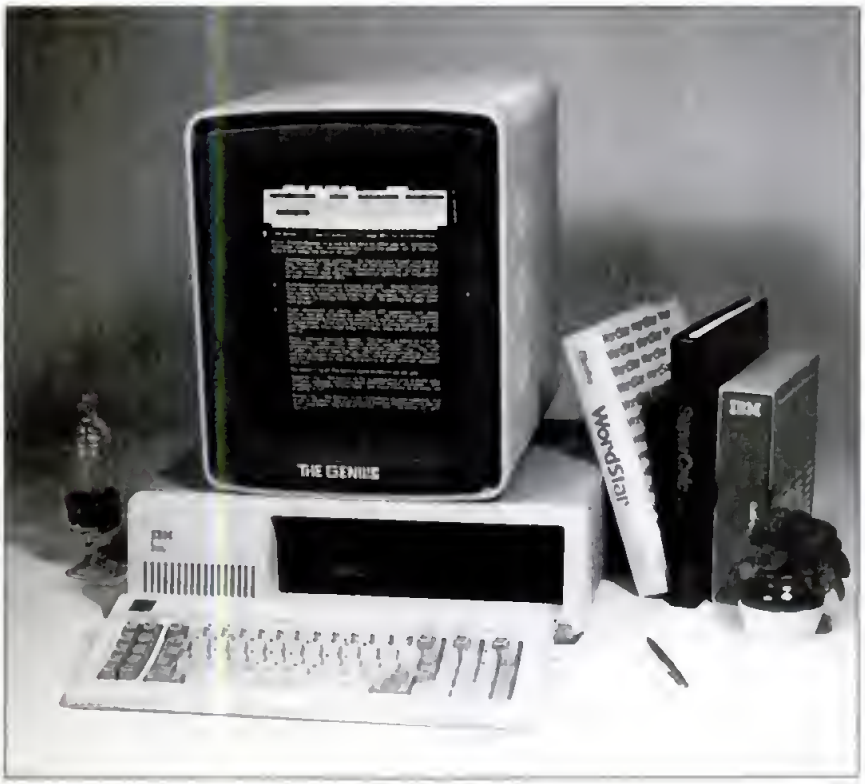
A Measure Of Genius

Think of this es Cineramo for your spreadsheet, Ponovision for your word processor, or Todd *A-O* for your time manager. The Genius full-page display gives you back the bottom half of your video screen, in a sharp, crisp white-on-black or bleck-on-white image.

The Genius is, et heart, just another monitor, but it does have a faw special features: To begin with, its display is 57 lines long, 80 columns wide. (Tha standard *WordStar* screen on a standard PC monitor is 23 lines by 80 columns.) It will also switch with software command between regular and inverse display. Clip-on plastic screens can be used to convert the image to green or amber.

The screen includes a 128-character ASCII set, and letters and numbers are drawn in a 9-by-14 dot box with 7-by-9 characters plus three-dot descenders—that translates into vary impressive resolution and crisp, clean charactars. Communication under PC-DOS is at 9600 baud, with tha devica capable of a top speed of 19200 baud. The screen in its box is rather large, dropping back 16 inches in depth and weighing in at a hefty 40 pounds. Its metal frame is paintad a near-IBM beige, and the front bezel is gray, marred only by a rathar tacky "THE GENIUS" label tacked on the front.

The best way to dascribe the place of The Genius in an IBM PC configuration is to think of it as a tarminal without a keyboard. It plugs into the PC through a standard RS-232C asynchronous port (using a special cable available from the manufacturer). A software set-up program configures the PC to transmit through the COM1 port. The screen has its own on-board 8K bytes of screen data buffar, and the vidao generator has 8K of memory for scraen update. A Z-80 microprocessor controls attributes and features. What this all means is that The Genius does not require either the color/graphics board or the



The Genius Model 102 monitor from Micro Display System shawing its unique (but expensive) 57-line screen display.

The Genius Model 102
Micro Display System, Inc.
P.O. Box 455
Hastings, MN 55033
(800) 328-9524
List Price: $1,795, cabla included.
Requires: Asynchronous port, cable, spacially adapted software.

CIRCLE 674 ON READER SERVICE CARD

monochrome-displey adapter in a PC.

The 57-line monitor can display 800 by 720 pixels. Total screen scroll is less than 3 seconds, according to the company. The monitor uses e low-persistence phosphor with the intent of eliminating blur from moving lines.

We worked with tbe monitor in both black-on-wbite and white-on-black modes, and though the letter-like appearance of the inverse screen is an attention grebber, we preferred the light letters against a dark screen.

The screen itself is 8-inches wide by 10½-inches tall. Those measurements are, not coincidentally, within a half inch of the size of a standard sheet of typing peper, and that is one of the merketing points for The Genius.

Yes, we know that we can scroll our copy up and down a screen with any competent word processor. And yes, we know thet there are dozens of decent and even superb monochrome monitors (IBM's own included) out there on the market. There is, then, the besic question: Who might buy this $1,795 lerge screen?

Well, eccording to Micro Displey Systems, manufacturer of The Genius, their market is the data-entry and word processing side of the business world, where efficiency and productivity is everything. There is also some claim that the high resolution and the availability of the inverse (black-on-white)

THE BASIC question: Who might buy this $1,795 large screen?

mode may be easier on workers who must spend hours in front of e tube.

"The concept grew out of dediceted word processors," said Jim Mathison, marketing director of MDS. "For composition and editing, you heve e full page of text at one viewing. This eliminates scrolling and trial prints, which are both costly in terms of time and productivity. The high resolution of this screen is difficult to put a price tag on."

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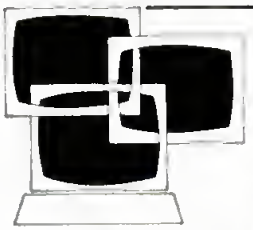

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Another area of use would be in program development, Methison said, with the screen displeying more than twice as many lines of code as an ordinary monitor would.

It should be noted thet the price of the screen is not quite as high as it might

THE COMPLEXITY, if any, might come with adapting software to use the long screen.

appear if the system with which it is used does not require a color/graphics adapter (IBM's sells for $244), e monochrome display card (IBM's is $335, with a parallel port), or enother monitor. An asynchronous port is required, though.

Mathison ecknowledged that one drawback to the present system is its inebility to do graphics. However, he said, a blt-mepped memory version is expected to be available in January, and thet should be ameneble to business graphics from the PC. The new version would require installetion of an MDS-supplied display card in the PC. (The Model 101, by the way, is en Apple-specific version.)

The instruction manual for The Genius is fairly straightforward, but might be intimidating to a first-time computer user. The monitor itself requires little more from the user than plugging it into the wall end the computer's seriel port and turning it on. The complexity, if any, might come with adapting software to use the long screen.

PC tested The Genius using e copy of WordStor edepted by MDS. The program worked without problem in both the white-on-bleck and black-on-white modes. MDS also supplied an altered version of SuperColc.

The manual includes vague instructions on how to redirect output of PC-DOS, CP/M-86, and UCSD Pascal, as well as patches to WordStar, Perfect Writer, SuperCalc, and InfoStar. If it were my money, I'd seek help from a dealer or MDS in this task. */PC*

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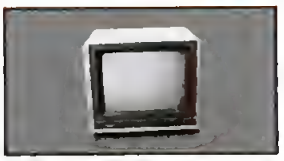

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Unlike most other integerated packages, FormManager's data management is not limited by memory size. It can handle up to 32,767 records, 10 forms per record, 100 fields per form and 80 characters per field. Its state-of-the-art B-tree technique assures you fast sorting and searching even if your data grows. There are several ways to search for a record randomly or sequentially.

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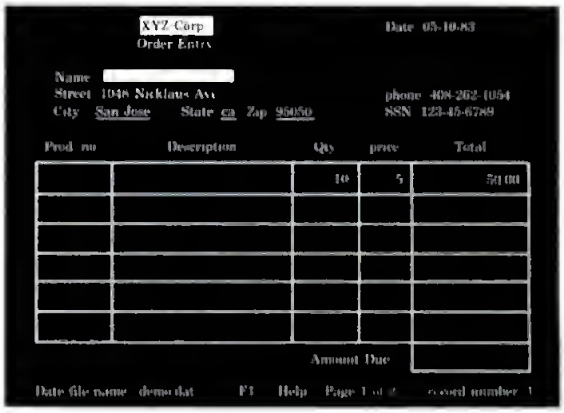
IF state = "CA" then TAX = sub_total * 0.065.



Printing, of course.

Print functions allow you to print from the screen to your pre-printed paper form. Or you can select to print any number of fields from all your records.

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CIRCLE 107 ON READER SERVICE CARD

Twelve invigorating exercises designed expressly to tone you up at the terminal, from one of New York's most exclusive gyms.

Computer Calisthenics

Photography: Hank Londoner

It is very late. I have been sitting in front of my monitor for 20 hours, maybe 21. Each time I reach down to save the file I'm working on and get some shuteye, a thin, high-pitched, doll-like mechanical voice whines from the speaker: "No, no ... don't turn me off. We're really making progress now. Just one more hour and we'll have it all done ..."

One more hour and they can use me for a granite gargoyle on the roof of the building. My neck is a raw, anguished knot of twitching tissue; I try turning my head in any direction and blue bolts of agony flash up and down my spine. Someone has funneled boiling lead into both shoulders, which seethe and throb with pain; the metal clots sluggishly in fingers that hammer slower and slower onto the home row.

Wedded intimately to the smallest seam and wrinkle in my chair is an aching, bloodless kiester pressed flat like a leaf in a heavy atlas. My legs prickle with enough pins and needles to make an overweight fakir's bed of nails feel like an eiderdown mattress. I spend the time shifting a massive cramp from one side of my back to the other.

The hour and the expended effort tug at me with a sinister gravity—this is what it must be like to write articles on the surface of Jupiter. I'm told there are 635 muscles in the human body. Every one of mine is kinked and sore. What I really want is to be kneaded back into life by a dozen well-oiled, giggling Tokyo geishas.

However, since I don't feel like springing for the $1,000 airfare to the Ginza, and since 15 hours in an airline seat would surely finish me off, I'll have to settle for the next best thing: the PC Magazine Daily

1

1. "Position your heels as close to the wall as you can, while keeping your back flat against the wall, and your feet together. Lift your arms forward in front of you, up to the wall behind you, then down to the side slowly, making sure you don't let your back come away from the wall. Breathe in deeply as your arms go up slowly and breathe out deeply as they go down slowly. Do this three times, and then reverse the whole procedure.

2

2. "Now lower your head and roll forward and down slowly until you can't go any further, making sure your stomach is held into the small of your back. Try to touch the ground, but go down only as far as you can without hurting yourself. Then roll up slowly, making sure every vertebra presses against the wall on the way up, until your head touches the wall again. Repeat this three times."

3

3. "Reach your arms out in front of you, then slide down and bend your knees as if you were sitting in an imaginary chair. Hold it for 3 to 5 seconds and slide up the wall until your legs are straight. Your back should stay flat against the wall.

Consult a physician before performing any rigorous exercise.

Dozen. Once I stretch my way through these salutary 12 exercises, I'll be primed for another 20-hour spin at the keys.

This regimen was designed by Romana Kryzanowska, proprietor of a chichi Manhattan gym called Pilates (pronounced pee-LAH-tees). Pilates is frequented by professionals—judges, teachers, actors, dentists, many of the area's top dancers, even astronauts. While New York City boasts hundreds of gyms with gleaming rows of sleek barbels and clanking machines, this one is built around miles of leather, canvas, and long steel springs. Romana charges $100 just to walk in the door, but this gives you five introductory sessions. Afterwards it's a straight $17 per.

While other gyms lure patrons with the promise of a bean sprout bar at one end of a giant Jacuzzi or videotapes of Jane Fonda bumping and grinding under an air conditioner vent, Pilates is strictly business. You move from a sliding rack-like device to a swinging apparatus that looks as if it is also used by Texans to barbecue pigs whole, to a series of mats and odd-shaped pommel horses. Romana reminds you that you can do most of the exercises at home against a wall or with a chair.

And you sweat. And you stretch. And you struggle through the contortions that look easy when Romana or one of her nimble, toothsome assistants shows you how. But afterwards you feel toasty, relaxed, composed, stretched, and supple. And you might end up rubbing elbows with celebrities; the gym is one of the best-kept secrets of New York's glitterati.

Phoebe, one of Pilates' flexible instructors, and this stiff, bone-weary writer, will demonstrate the *PC* Daily Dozen, with narration supplied by Romana:

4

4. "Turn around and face the wall. Put both hands on the wall in front of you about shoulder-high, with your toes about 2 feet away from the wall, so that your body is perfectly straight. Bend your elbows outward until your forehead touches the wall; then straighten your arms until you return to an upright position. Do this three times."

5

5. *"Try the same thing sideways. Stand with your left hip a foot or two away from the wall, and put your left hand against the wall at the height of your shoulder. Lift your right arm up over your head, stretching away from the wall. Turn around and repeat these on your left side."*

6

6. *Keep your left hand in the same position, shoulder-high against the wall, and move your right hand under it to the level of your hips. Then bend your hips slowly towards the wall, stretching your whole left side. Do this three times, then turn around and repeat it on the other side.*

8

8. *"Next, sit very tall in the chair—keeping your stomach in—and bring your shoulders first to the front of the earlobe, then tu the back of the earlobe and down. Rotate your shoulders forward three times, then reverse them and rotate them backward."*

9

9. *"Push your back and stomach into the back of the chair as far as you can get it. Then lift your thigh up to your chest, hold it with your two hands as if in a vise, and (. . . ugh . . . stroin . . . tear . . . rip . . .) try to straighten and stretch the leg. Make sure that your hips are absolutely straight across; don't tilt your body."*

7

7. *"Stand up and face a chair. Put one foot in the middle ond hands on the arms or back of the chair. Keep the leg on the chair straight, ond bounce down gently onto yaur knee, try to get your rib cage to touch your thigh, bending into it each time. Try to touch your head to your shin but dan't overdo it. Now bend the leg that is on the chair as deeply as you can, towards the back of the chair. Keep your other leg stroight, and stretched. Bounce forward onto your knee three to six times. Then switch legs."*

10

10. *Sit very tall, pushing yaur neck far up out of your shoulders. Drop your head slawly farward as far as yau can and count to three. Then lift your head tall ogain, drop your left eor toward your left shoulder, and stretch. Count to three, lift your head tall, then do the same to the right. Finally, drop your head in back of you and then lift it toll. Always remember to move your neck slowly.Then roll your heod slowly around in all four directions—and reverse it slowly, making a circle each time.*

11

11. *"It is very impartant ta shake yaur body and get the blood moving. While you're in the chair, put your feet out in front of you and make big circles with your ankles and shake your feet. This is also gaod after yau've been sitting in an airplane seat for a long time."*

12

12. *"Then, simply shoke your fingers vigorously. Make big circles with both arms simultaneausly without letting the rest af your body move. You can do this either sitting or standing. When you shake, start with the neck—slowly—then go to the shoulders, and end with the arms and fingers.* ***/PC***

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Now you can be sure
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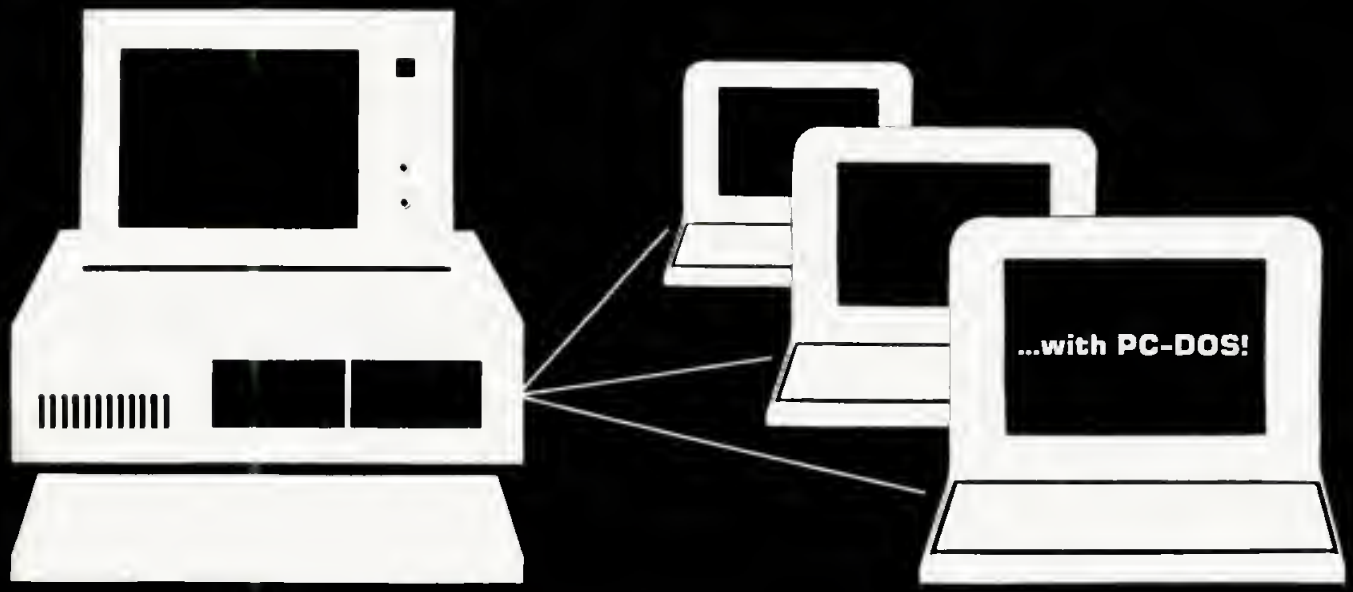

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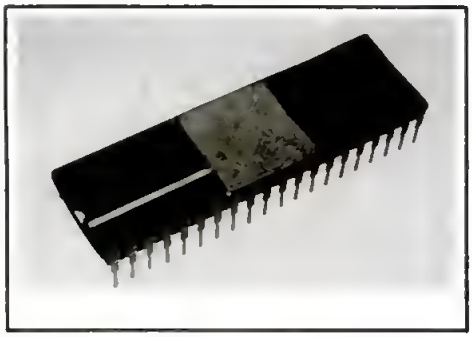

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The Hyperion's 7-inch screen and unconventional looks make it a nice desk ornament

The Hyperion was first designed by a company called Dynalogic Infotec, an Ottowa-based manufacturer of floppy disk subsystems and small microcomputers. Another company called Bytec became interested in the design, funded the project, and eventually absorbed Dynalogic. The parent company is now known as Bytec Hyperion. You'll see references to Dynalogic in the documentation, and the name is all over the circuit boards inside the unit, but Bytec's the name.

I first saw the Hyperion all the way back at Comdex '82. There were some prototypes and a gaggle of beautiful models distributing equally beautiful literature. It was the first portable IBM compatible to appear at the show, and it was received enthusiastically. I, for one, couldn't understand what all the fuss was about. After all, the design was unconventional, to say the least; the screen was small and the price didn't seem aii that attractive. Still, it won a lot of attention, and the IBM market watchers waited expectantly for Hype-

rions to appear in production quantities. As fate would have it, a couple of other portables beat it to market, most notably the Compaq. But the Hyperion kept showing up at all the important trade shows with its dazzling graphics displays, and its logo—a star nested in the letter o of Hyperion—against the distinctive amber screen.

THE CHARACTERS are crisp and the focus is sharp, so you never have a problem discerning the words, or whatever.

Now, as I sit at the Hyperion, writing this article, I am far more impressed than I was then. This Canadian cutie is as nice a desk ornament as one could ask for. It isn't perfect, but it isn't far off the mark, either. In a world that, of late, has grown rather crowded with horizontal boxes with monitors perched atop them, the Hyperion's dramatic good looks are refreshing. The pair of Remex disk drives, stacked horizontally on the front panel, have unique push-to-open, push-to-close door locks. Also on the front panel are the brightness and contrast controls for the 7-inch monitor and an on/off switch, thoughtfully recessed to avoid inadvertent catastrophes. The on/off switch illuminates when the machine is on—a good idea, since a screen-saver mode will blank the screen until a key is pressed, if you haven't communicated with the system for the past 3 minutes. In a normal office, you can't hear the fan, unlike, say, the IBM PC-XT, which sounds like an infant air raid siren. My only criticism is that the pilot light is too bright. It is the same amber color as the screen, and it competes with the cursor for your eyes' attention. I found the system more pleasant to use after I had covered it with a piece of masking tape. If I owned the machine, I would put a dropping resistor in the line to the bulb to reduce its intensity.

The keyboard is yet another variation of the Key Tronic Soft Touch line. It has the same number of keys as the IBM and they are labeled in pretty much the same way, with the exception of words for the Tab and Rtn keys, instead of the cryptic arrows on the IBM. The return and shift keys are placed in the conventional (typewriter) locations instead of the dumb PC arrangement. The function keys are arrayed along the top of the keyboard, mak-

HOW HARD would it be to put deeper indentations on the F and J keys?

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ing it easy to label them on the bottom of the screen. One thing I don't like is the location of the Num Lock key at the right of the top row. That's where you instinctively reach for backspace, which, on the Hyperion, is one row below, mislabeled Rub Out (a synonym for delete on a teletype machine). The touch is too light for my taste, though not quite as light as that of the Eagle PC. Some of the keyboards that Key Tronic builds for the stand-alone-terminal market feature stronger springs on such nontyping keys as Esc, Num Lock, and the other control functions. Your fingers know instantly when they've found a noncharacter key. That feature would be welcome here. Also, how hard would it be to put deeper indentations on the F and J keys? Another overlooked area is the size and shape of the contact area on top of the key. By carefully mixing keys of different sizes and shapes, manufacturers can provide an environment in which your fingers will never get lost. Unfortunately, the only key that has a contact area larger than a Chiclet is the Rtn key. Really, folks, it isn't difficult to design a good keyboard, just ask me and I'll give you all the specs.

You can overcome screen size limitations by adding an outboard monitor.

What's it like using a 7-inch screen with a full 24 × 80 display? Well, as they say, you can get used to anything. As a matter of fact, when I went back to a 12-inch monitor after using the Hyperion for a while, I felt like my eyes were roaming all over the place, and the characters seemed grotesquely large. I would prefer a larger screen if I were to use it all day everyday, but stints of just several hours at a time are not unduly taxing. The characters are crisp and the focus is sharp, so you never have a problem discerning the words, or whatever. The amber characters seem to have a higher contrast ratio to the dark background phosphor, more so than the typical green displays. Also, the screen display is resistant to washing out in bright light, at least more so than the IBM monochrome display. On the other hand, the characters are coarser than those on the IBM, but the small size blends the dots together reasonably well.

Specs and Innards

The Hyperion has some of the usual PC-compatible innards, including an 8088 running at 4.77 MHz and a socket for an 8087. Support chips such as the Direct Memory Access (DMA) and timer are the same as the PC's. There is 256K of parity-checked RAM, and a single 2764 EPROM handles the bootstrap and power-on testing chores. Dynalogic's designers

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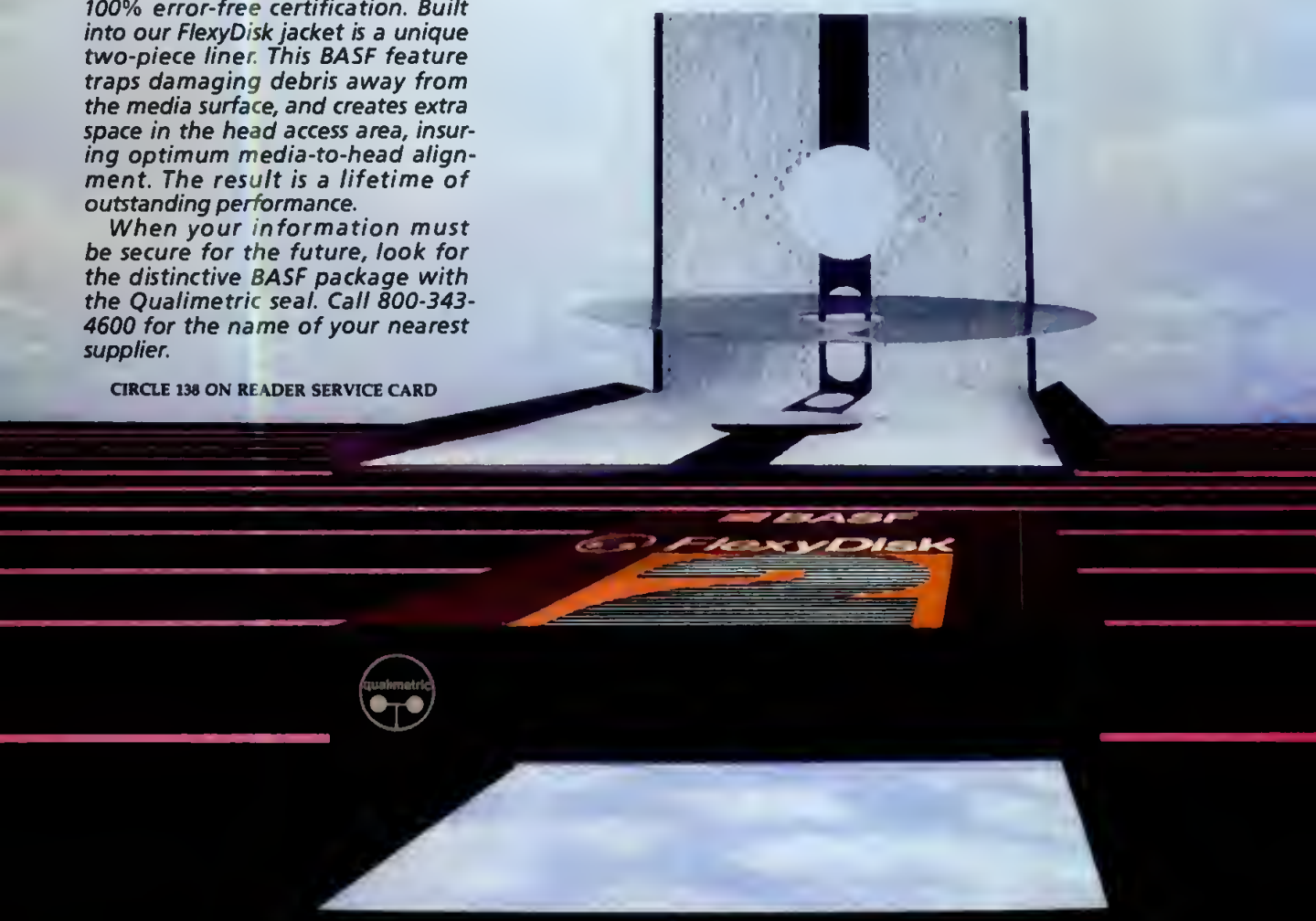

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achieved some of the compactness by using Programmed Array Logic (PALs) chips. They permit the designers to "invent" their own logic chips when standard off-the-shelf parts will not do the job. This makes it harder for a competitor to copy Hyperion's design. All of the Hyperion's intelligence is arrayed across two multilayer printed circuit boards, which stand vertically at the rear of the machine. The forward board has the 8088, disk controller, memory, and associated support chips, while the other has the CRT controller, serial and parallel I/O, and connections for an internal 300-baud modem. There is an output for composite video, so you can overcome screen size limitations by adding an outboard monitor. There are no expansion slots inside, but a connector attaches to an expansion box intended to sit next to the Hyperion. It can hold seven IBM-compatible boards and a Winchester hard disk.

The display memory is CMOS static memory, a significant departure from the usual technology found in personal computers. Most use dynamic memory, which, while cheaper, causes problems in designing the refresh timing circuits in a way that will not interfere with the image being displayed on the screen. Static memory requires no refresh and thus simplifies circuit design. Also, it consumes infinitesimal amounts of power. The video monitor board is made by Philips, using a Toshiba flat-faced CRT. The display controller is a 9007 instead of the typical 6845 found in most IBM compatibles. Firmware within interprets IBM-style graphics commands and converts them to work with the Hyperion. More on this under compatibility.

PRINTER drivers are normally installed by your dealer to match your printer.

Serial I/O chores are handled by a Zilog SIO chip, one of the more powerful chips around. One chip provides two channels of serial I/O, providing COM1 and modem control. That's good from a size-efficiency standpoint, but it prevents you from using any of the programs designed to function with IBM's asynchronous card, such as Hostcomm and PC-Talk. The SIO's internal commands are different from the chip used by IBM, so you have to use the software Hyperion provides.

Connections abound on the back of the machine. In addition to the composite video output, there are three RJ11-type phone jacks. One connects to the wall, another to your phone, and the third is for acoustic modem cups if, for some reason, you can't hook up directly to the line. There is a serial port and a parallel port, using the same dumb 25-pin connector that IBM chose for the PC. At the far right of the machine is the external expansion connector.

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Marketing

Hyperion is being advertised io business magazines, in-flight magazioes, and weekly business aod news magazioes, io addition to the personal computer press. Bytec Hyperion is building a dealer network through such retail chains as ComputerLand and The Computer Store, as well as independeot computer stores. Currently, all Hyperions are built io Canada. Bytec is subcontracting manufacturing to SCI, the Alabama-based firm that builds the system boards for the IBM PC. The ultimate goal is that all units sold in the United States will be built here. Andersoo-Jacobson (A-J), the lease and rental giant, is OEMing the Hyperion, which means that it puts its oame oo the machioe and markets it through its own sales and distribution channeis. A-J has always had a penchant for portable computing gear, and its selectioo of the Hyperioo is e nice vote of confidence.

All dealers are expected to service the Hyperion on-site, and Bytec has instituted a training and parts program to support them. They will also be trained io Hyperion-supplied software.

The minimum-configuration Hyperioo has one drive and 256K RAM, BASIC, and MS-DOS. It sells for $3,195. The two-drive model costs $3,690.

THE Hyperion's dramatic good looks are refreshing.

Software

The Hyperion has available a variety of software packages to round out the system: a text editor called *IN:SCRIBE*, a communications package called *IN:TOUCH*, and good old Microsoft BASIC. *IN:SCRIBE* costs $155, while *IN:TOUCH* is $395 aod iocludes a 300-baud modem, or is it the other way around?

IN:SCRIBE is a Hyperion-developed word processing package. It makes full use of the Hyperion's function keys and video attributes. It is a what-you-see-is-what-you-get editor, in the spirit of WordStar. The arrow keys perform cursor control duty. The Ctrl key acts as an amplifier, so if you press the arrow keys alone, the cursor moves e line or character at e time and moves a paragraph (vertically) or word (horizootally) one at a time, wheo you press the Ctrl key. Similarly, you cao delete a character by pressing the delete key, aod a line by pressing cootrol-delete. There are soft keys for deleting words and for deleting from the cursor to the eod of line. You can mark and move blocks of text around io the document, and the soft keys aod oo-screeo status iodicators make it easy to keep track of where you are. *IN:SCRIBE* edits only in memory, which is a poteotial limitatioo. That is, large files are not scrolled from disk through memory and back to disk.

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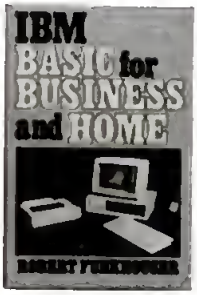

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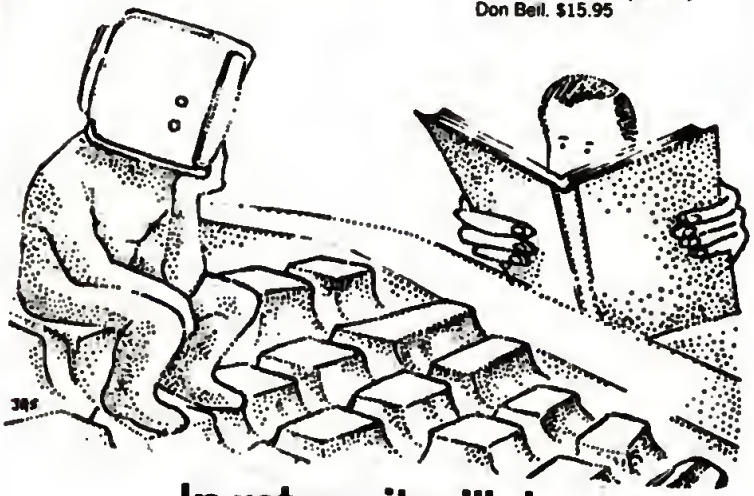

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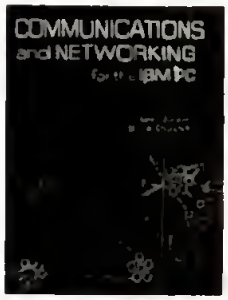

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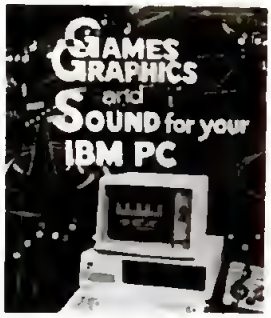

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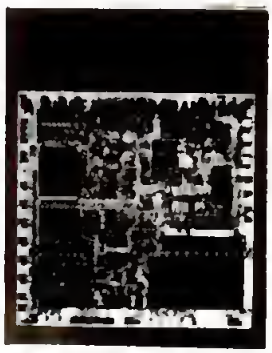

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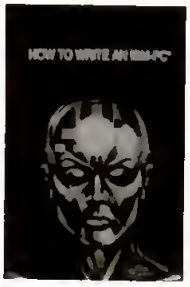

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Printing with *IN:SCRIBE* involves directing your finished document to a printer driver, which interprets commands such as boldface and underline and converts them into appropriate commands that your printer can understand. Printer drivers are normally installed by your dealer to match your printer. The advantage to this approach is that you can have several driver files for compatibility with a variety of printers and output ports. Soft keys allow you to easily select the print enhancements you want.

Like all the soft key functions on the Hyperion, *IN:SCRIBE*'s are fully nested and help is always available by pressing F10. Conceptually, the editor is simple enough, so that once you've read the manual, the help key and labeled function keys should be sufficient to keep you out of trouble. Of course, there is a price for such simplicity. Mail merging functions are not provided, nor are such advanced formatting features as power indent and vertical spacing controls. On the other hand, its capabilities will be more than sufficient for day-to-day memos, letters, and even program writing.

I found *IN:SCRIBE* easy to learn and use, although it was sometimes annoying not to have the soft key I wanted immediately available. Since they are nested, you have to go through a two-level access routine and return from one kind of soft function and go to another. One figure in the manual summarizes the whole shootin' match, which should be a great help to the new user. A feature that I particularly liked was MYKEY. When you press a function key defined as LEARN, *IN:SCRIBE* records a series of commands and performs them each time you press a MYKEY. There are four MYKEYs available and you can label each of them. WordStor should be so smart. Another useful feature is the UNDO key, which, predictably, reverses the last action you performed, a lifesaver when you inadvertantly delete something valuable.

IN:TOUCH is the communications program. It controls the internal 300-baud modem, dials the phone via pulse or tone, steers communications through the serial port if you desire, maintains one or more directories of phone numbers, and even controls the volume of the internal speaker when you are monitoring the phone line. There are special speed dialer files that allow faster access than the usual dialer files for frequently called numbers. You can configure the communications protocol to your heart's content, including X-ON/X-OFF handshaking and a slow-send mode. Like *IN:SCRIBE*, it has a LEARN mode that remembers the log on sequence for a given number. Once you record it, a single soft key dials the system and another logs you on. What could be easier? *IN:TOUCH* even has a predefined key for PC-to-PC communications. Soft keys, not surprisingly, initiate upload and download of files.

WHEN I WENT back to a 12-inch monitor after using the Hyperion, I felt like my eyes were roaming all over the place, and the characters seemed grotesquely large.

All of *IN:TOUCH*'s functions are controlled by the soft function keys, in the same logically nested manner as *IN:SCRIBE*. It is as complete as any of the commercial communications packages currently on the market and provides a high level of integration with the Hyperion. It is simple enough to use so that a novice will have little or no difficulty calling time-sharing services or bulletin boards. The more interested or advanced user will find enough features for virtually any other communications tasks, including emulation of some popular terminals. There is a lot to learn here, more than *IN:SCRIBE*, but the documentation is tutorial and takes you through step-by-step.

Yes, the Hyperion supports a spreadsheet, and yes, it's Multiplon. Our testing lab—we call it the Toy Shop—is littered with unopened *Multiplan* documentation packages and disks from all the machines under test. Talk about a de *facto* standard. Other than adding a help file, *Multiplan* is unmodified from its usual operating modes and does not make use of Hyperion's function keys. Hyperion's version of

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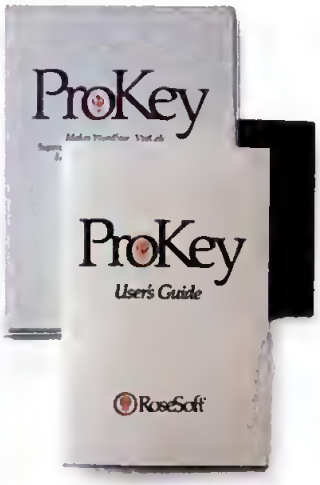

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To run ProKey, you'll need an IBM Personal Computer or workalike, DOS (any version, including 2.0), and 64K of RAM (WordStar requires 96K).

WordStar, VisiCalc, Lotus 1-2-3 and dBase II are trademarks, respectively, of Micro Pro, Visicorp, Lotus and Ashton-Tate.

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Multiplon is available for $250. You can also get Lotus' 1-2-3 for $495.

Modifying the DOS

The Hyperion's operating system is built around MS-DOS 1.1. I say built around because there are some significant enhancements. Foremost is the on-screen display. The bottom line of the screen defines the function keys, which perform mundane DOS operations such as DIR/P, CHKDSK, and the like. General help and information on specific processes are just a keypress away. Any function keys that have submenus of new function key definitions are underlined. Pressing an underlined function key causes the keys to be relabeled. F10 retains its HELP definition and F1 returns you to the prior set of key definitions. It's all very logical; once you get used to it, it spoils you a bit.

All Hyperion-supplied programs keep you apprised of the status of your Caps Lock and Num Lock keys. In the space between the two groups of five function key definitions, there is a digitel clock display and a bit of space to the right. When Num Lock has been depressed, a number sign (#) appears. If you've depressed the Caps Lock key, an up-arrow (↑) appears between the number sign and the time. Very handy—I wish it worked while in WordStor and d*Base II*. But programs that clear the screen, like these, make the status line go awey, and it doesn't come back until you return to DOS.

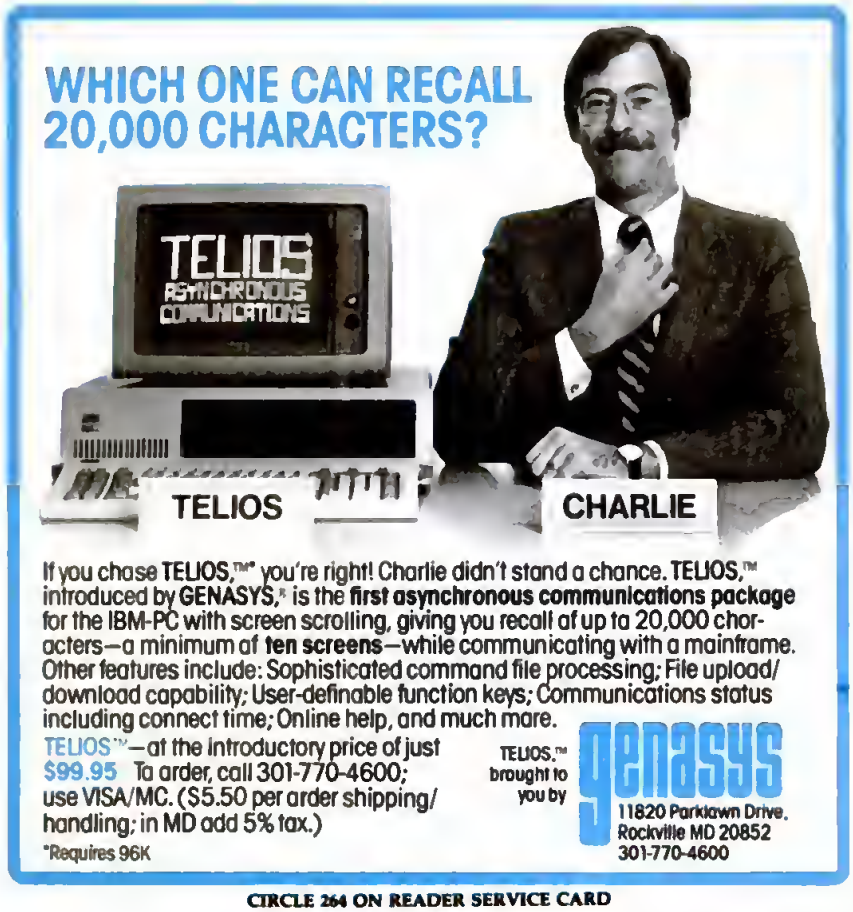
The Hyperion's 256K RAM is put to good use, as it includes a RAM disk driver. The MODE commend sets the size of the RAM disk, from the default 90K. The application disks that come with the Hyperion are set up with AUTOEXEC.BAT files that load the most often used routines called by function keys into RAM disk (drive C:) and then log into C:.

Hyperion's MODE command is totally different from thet of the IBM PC's. It uses a full-screen edit mode, nested menus, function keys, and on-screen highlighting to guide you through reconfiguration of any of its common operating modes. For instance, your choices upon starting the program are SCREEN, LPT1, the RAM disk, and COM1. If, by wey of example, you select SCREEN, you get a display of all the options available for screen configuration. These include interpretation of control sequences, emulation of the IBM Color Graphics Adaptor, 40- or 80-character mode, and whether or not the function key definition line will be displayed. An important option within SCREEN is the abillty to select IBM monochrome or color emulation or to let the machine make up its own mind based on the program running. COM1 provides a menu of baud rates, data and stop bits, and parity checking. You simply step through the menu with the cursor keys, your choices and changes clearly indicated. This is the way computers were meant to be.

YOU SIMPLY step through the menu with the cursor keys. This is the way computers were meant to be.

When you've made all the changes you'd like in e given MODE session, you can save them to disk A: or B:, or just modify the memory image of DOS currently running. This latter feature is handy for testing a new configuration without committing it to disk or bothering to reboot.

Compatibility is, in a sense, a state of mind. For all the hardware dissimilarities between the Hyperion and the IBM PC, they are strikingly compatible. In fact, only the Compaq comes closer. Tbe reason for this is that the display is capable of imitating the Color Graphics Adaptor as well as the standard monochrome display. It substitutes intensity levels for colors and provides the same grapbics resolution. Maybe the magician's phrase of the future will be, "It's all done with software." That's certainly the case bere. Without so much as e configuration switch, you can flip back and forth between color and monochrome compatibility or let the Hyperion make up its own mind which to use.



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How well does the Hyperion work in practice? Not too badly. The color programs I had available were mostly games and most of them ran fine. Occasionally you will run into e direct ROM call that the Hyperion can't handle. Obviously, progrems with direct ROM calls are not written to MS-DOS or IBM specs, but they're not about to go eway, either. When confronted with such calls, the Hyperion generally returns directly to DOS—Do Not Pass Go, Do Not Finish Your Game. Fortunately, none of the business software we tried on the Hyparion had such dire effects. The enswer is that you should ask before you buy, end test if at all possible.

THE Hyperion's unprepossessing appearance doesn't raise so much as an eyebrow as you walk down a crowded New York street.

You may get two-thirds of the way through a game before it blows up. I also tried *Bottom Line Strategist* and it drew its repertoire of graphs on the screen with alacrity. Detabase managers such as d*Bose II* ran also. *WordStor* ran just fine, with no hitches.

The key to some of the compatibility is the MODE program, mentioned earlier. *WordStor*, for axample, requires thet you set the screen mode to monochrome. It gets confusad if you let it pick for itself. Likawise, some gamas written for the color monitor will malfunction unless you lock in color competibillty. The rest of the progrems switch dynemically.

A Gym-Bag Computer?

Whara doas the Hyperion fit in the PC marketplace? Just about anywhere, thanks to its diminutive size. Really, it's more end less than an IBM-compatible machine. On the plus side, the dual-mode display gives you access to nearly the entire universe of programs. Its well-conceived function key system allows painless access to ell standard MS-DOS features, and more. The bundled software is fine, with all the feetures you need to get going. The generous 256K memory is all you really need, unless you're med for RAM disks and spoolers. Size, weight, and packaging are obvious pluses. The machine is a reel head-turner, though not in the same league as the GRiD Compass.

On the minus aide, tha leck of expansion slots (even one would help) maans thet the machine must suit your needs exactly as it is. Although tha standard Hyperion will cover 95 percent of the averege PC owner's needs, it's not for you if you want to edd some speciel function cards and meintain portability. There's nothing wrong with the keyboard thet isn't wrong with nearly every other one, so I won't put that on the debit list, except that the flip-down feet should heve rubber tips to resist slippege. I stuck two pencil eresers into recesses in the feet and the stebility improvad immansely.

Squarely in the middle of the balance sheet is the screen. Can you live with e 7-inch screen? Only you can provide the answer. I'm getting to like it, but some 12-inch screen users are unwilling to make the effort to edjust to it.

The Hyperion's greatest attributa in tha office ia the ease with which it desk-hops. A quick editing job here, dial up a service bureau there, input 50 namas and addresses into a datebase. Hook it up to e 1200-baud modem for some bulletin board prospecting, then plug in a fast printer to dump the treasures. It came home with me for the weekend and proved itself to be e very angaging house guest. The travel case is similar in appearance and e little larger then a vinyl gym bag. The Hyperion's unprepossessing eppeerance doesn't reise so much as an eyebrow as you welk down e crowded New York street. So it's not a lep computer, and it's not e GRiD. But it isn't the size of e sewing machine, either. Let's call it a gym-bag computer and leave it at that. Tha ball is in your court. */PC*

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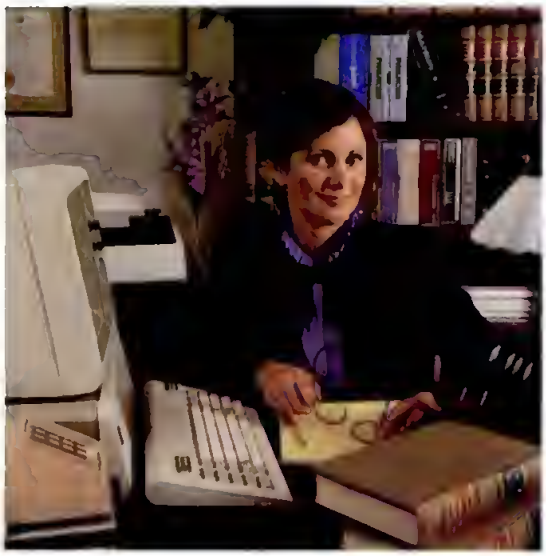

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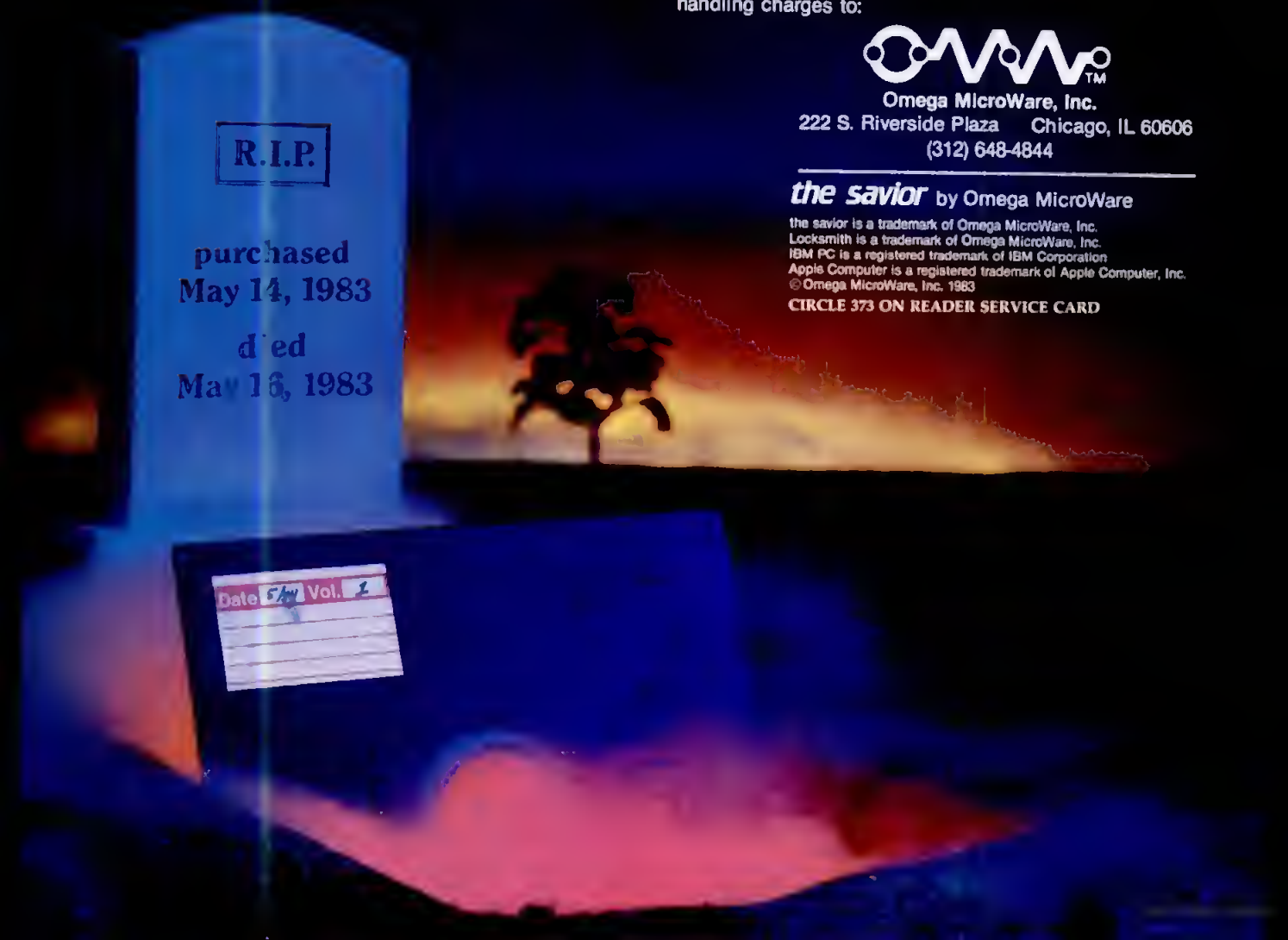

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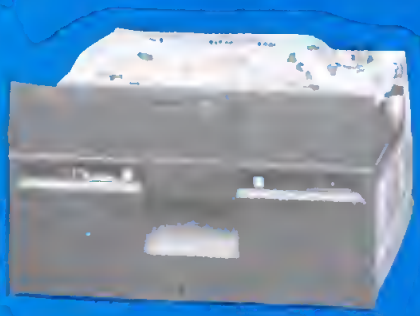

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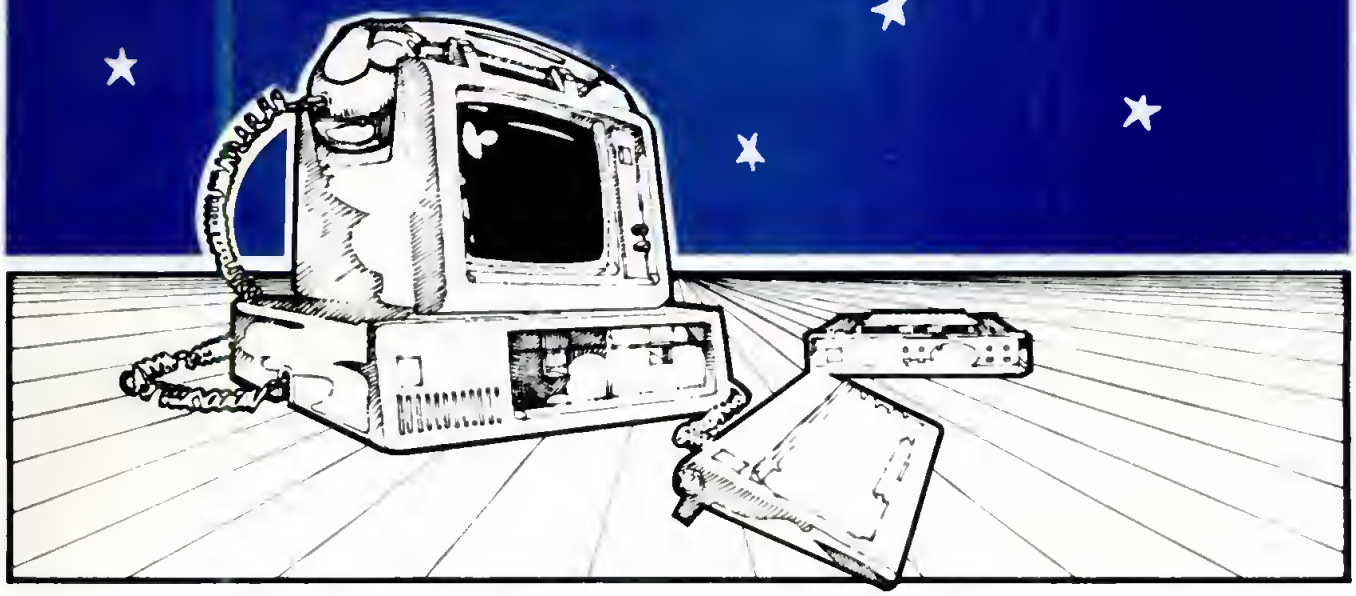

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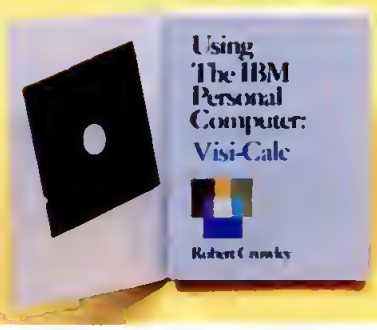

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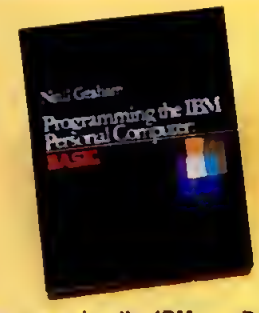

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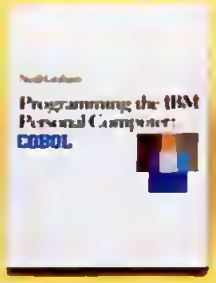

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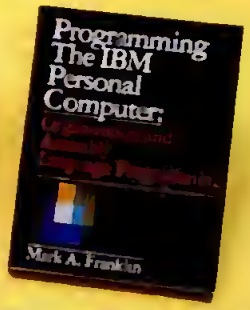

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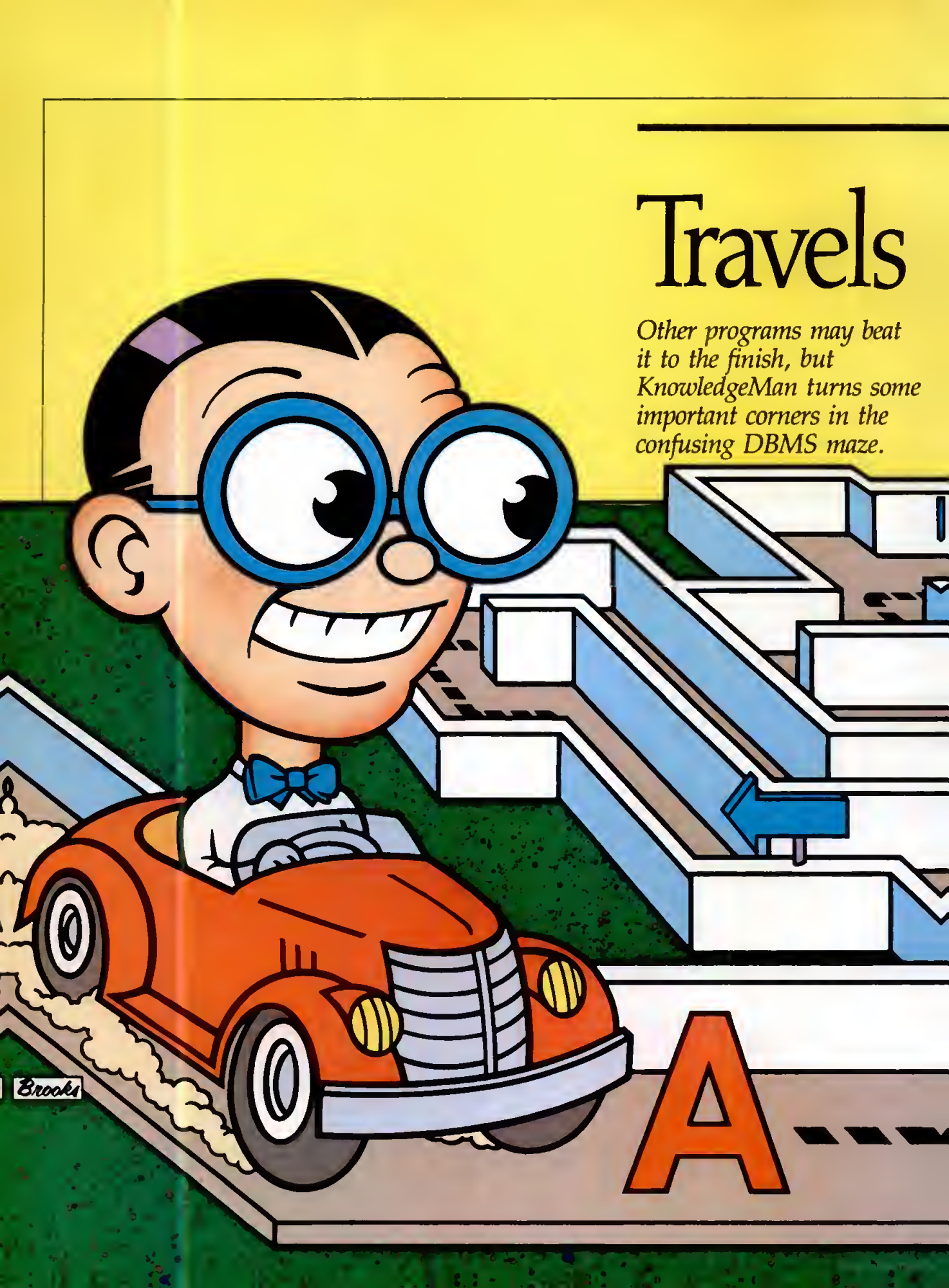
Travels

Other programs may beat it to the finish, but KnowledgeMan turns some important corners in the confusing DBMS maze.



With KnowledgeMan

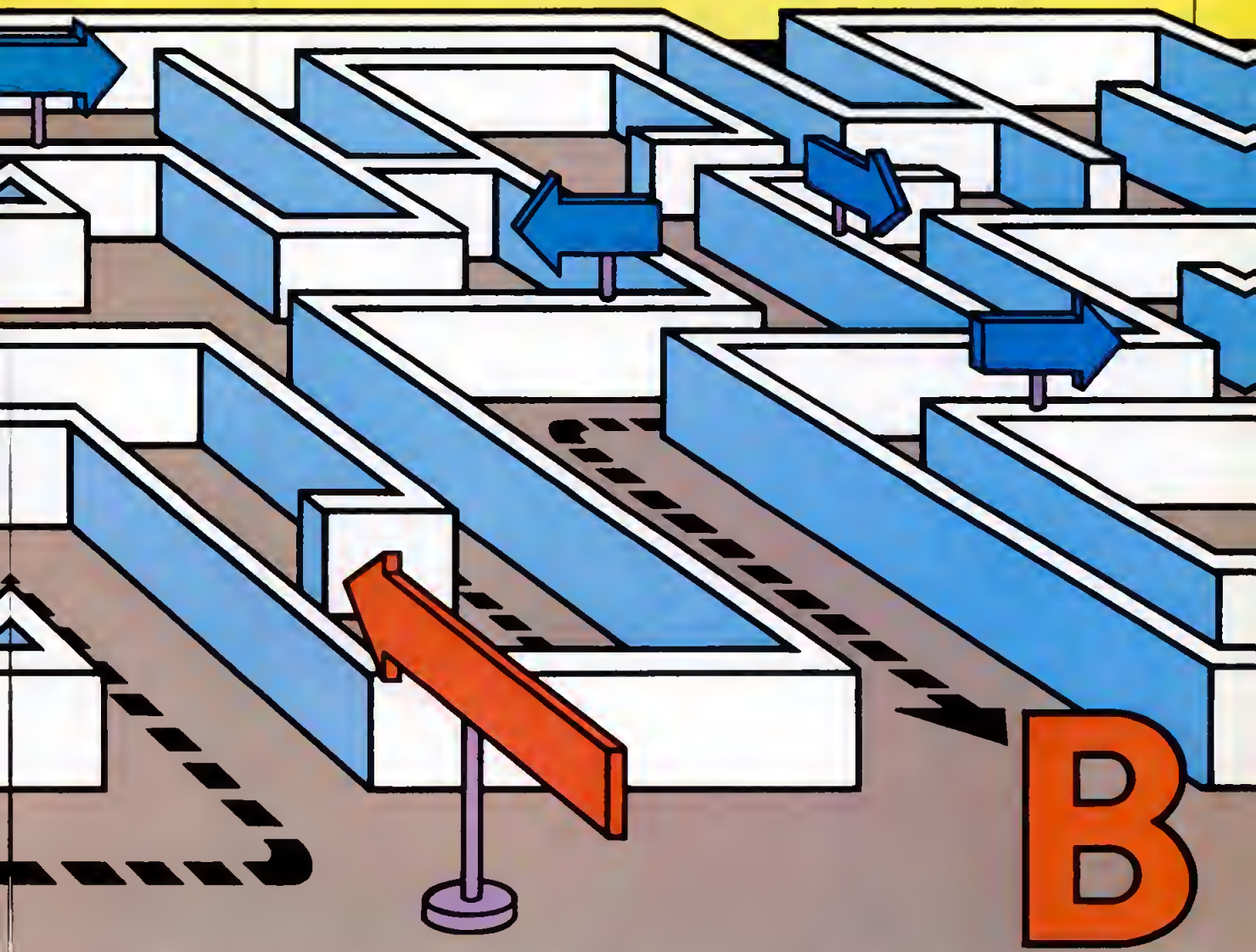
This morning, my partner, Bob, came bouncing through the door of our office at 2D Computer Consultants with a new-looking three-ring binder under his arm. I immediately moaned and reached for my alpha-wave biofeedback monitor.

"I'm going into a trance," I said. "Don't bother me."

"Trance smansh," Bob replied. "Your batteries are all corroded and brown crud is leaking out of the case. You wouldn't hear anything even if you knew how to turn that thing on."

Bob is an engineer, and he firmly believes that non-engineers can't even turn on light switches without his expert advice. I'm a programmer, and I know that engineers shouldn't be allowed near functional computers without being physically restrained. They are always wanting to solder jumpers and change chips and do other strange things that need hours of programming to make them work again.

The thing that upset me about Bob's



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entranca was the bindar he was carrying. It was obviously soma kind of naw software ha had bought without telling me. Obvious, too, was the fact that he couldn't gat it to work. Disks ware falling out of the binder, and the pagas were raggad and torn. He hed that the-world-would-be-a-better-place-to-live-in-witbout-programmars look on bis face.

"Wbat's that?" I asked innocently.

"Anothar product of a pampared programmar with mainframa mentality," he replied with a glare.

Mainframe mentality is our shorthand tarm for tha opinion commonly held by old-time corporata ADP types that the users are all idiots and that "usar friendly" is a synonym for wasted overhead.

"What is it?" I repaated.

"Tbat new program released by Micro Data Base Systams, KnowledgeMon. You bava to do ell kinds of things to gat it to run. I can't even maka the demo disk work."

"Give ma tha manuel and let me see if I can figure it out. Meanwbile, why don't you see if you can intarfaca that new Amdek plotter to the PC."

Installation Snafus

Tha KnowledgeMon binder was the 8 ½-by 11-inch siza, and it contained ovar 400 pagas of single-spaced documentation. Obviously, I thought, thay must tell you somathing about the program in this much documantation. But tha more I read tha more confusad I became. I had to jump between Section Threa: "Customizing KnowledgeMon for Your Terminal," Appandix D: "Systam Specific Notes for 8088/PC-DOS," and an errata sheet. I daveloped a mental picture of the steps needed to install tha software et tha sama tima Bob finally got tha plotter to print e graph using *1-2-3*.

"They found a bug in PC-DOS 1.1, and they want you to use DEBUG to fix it before you install the program," I axplainad as ha re-tinnad his soldaring pencil. "That's all vary simpla; e child could do it. Than you hava to format soma disks with a system, transfar soma filas, and figure out that you don't really hava to run tha TERMAN tarminal drivar utility as it says to do on paga 47 becausa thay alraady gava you tha utility program in Appendix D. That's all."

Bob punctuatad the air with his hot soldering pancil and uttered an explativa. "This program costs 500 bucks. Couldn't they have just licensed a debuggad version of tha DOS and givan you the installad disks?"

"What varsion of DOS? Which format for tha disks? How many sidas? This mathod givas you software portability. Think of the flexibility." A showar of hot soldar flew in my direction; I shialded myself behind tha bindar.

Actually, I could think of three ways the installation of KnowledgeMon could hava bean mada easiar. It would have bean a ralativaly small pieca of work to writa an intaractive installation program. This cartainly would increasa tha reputation of tha program and reduce tha bad prass I falt it was bound to receive.

The command line at the top of the screen tells the KnowledgeMan program to bring out the data in the order given. This is a simple retrieval of data. Note the statistics provided at the bottom of the screen. For some reason our program never picked the correct minimum value.

The directions for installation could be simplifiad greatly, or the saparate section on PC-DOS installation could hava baen mada more directiva and complata. Or, lacking that, installed versions for tha popular systems like the IBM could heve been made availabla.

THE BINDER obviously was some kind of new software he had bought without telling me.

"OK, coma watch. This DEBUG process won't take long." Bob sat so that he could just saa tha scraan whila ha kapt his hands busy making a hangman's noosa out of a scrap of hookup wire.

"MDBS claims that thay found a bug in PC-DOS 1.1 that somatimas causas the DOS to think it wrota data whan it really didn't. They giva good instructions on how to change the valuas in a couple of locations. Than you just have to copy the right salection of filas from the mastar disk onto a working disk, and you ere off and running."

I set the PC to the task of copying files as I axplained tha process. Than I asked the quastion that had been on tha tip of my tongue sinca Bob walkad in. "Now tall ma, why did you buy this thing, and wbat is it supposed to do?"

"You'va seen the eds! This is supposed to be the friendly and intelligent program that gives you the 'best of tha data-management and spreadsheat worlds.' Thay compare it with dBose *II* and 1-2-3 and show how much batter it is supposad to be. I wantad to undarstand this database-managamant stuff, and I figured I would start with tha best. I didn't count on all of this patching and programming."

I don't know anybody alsa who can maka "programming" sound like a dirty word, but I didn't reply right away. I had seen the eds for KnowledgeMon, and thay promisad a lot, but this com-

plicated installation routine was not very impressive. "Let's see what this program will do before wa draw any strong opinions."

A Familiar Language

The documentation for KnowledgeMon becomes better organized once you move into the operational areas. I was paging through the manual when I saw a bunch of familiar commands and suddenly falt like somebody hed brought out a mep to show me where I was. "Hay," I exclaimed, "this thing uses SQL!"

"Oh yeah," Bob sneered. "Is that anything lika 40-pin DIP socket?"

"Well, if you mean is that a standard for the industry, you are pretty close. IBM has e hard-working old mainframe database-management program called the Information Management System or IMS. In 1981, they introduced a relational database system for mainframes called Structured Query Language that they are promoting heavily. SQL is getting to be pretty popular, and almost every big manufacturer is coming out with similar software. The SQL query language is like BASIC to mainframe Data Base Management Systems (DBMS) programmers. If you learn this one, you will have developed a skill you can use in a lot of other different situations."

The program hod to do a little more work to provide this dato. We asked it to provide all items with a cost greater than $400. Many other limitations and conditions can be included in one SELECT stotement.

```
_select source, category, cost for cost >400
   SOURCE      CATEGORY      COST

Smithfield     White         525.00
Round Lakes    Burgundy      450.00
Wilson         White         550.00

Number of Observations:  3
                          1525.00   Sum
                           508.33   Ave
                          2700.33   Var
                            52.04   Sdv
Round Lakes    Burgundy      525.00   Min
Wilson         White         550.00   Max
_
```

Bob moved over to get a look at the manual and asked, "How hard is the language? Can I learn it fairly quickly?" He asked in more than a casual manner, and t looked at him out of the corner of my eye.

> ***THE REAL power of any DBMS is in its ability to pull out data characteristics you specify.***

Before, he had always been content to leave the programming to me, and I couldn't understand his sudden interest.

"It's not hard," I responded. "The commands use English verbs and there are probably only 10 or 12 you use on a regular basis. Let me run you through it.

"You start with a DEFINE command, telling the system to set aside a file for the table you want to use. When you do that, the program asks you for the fields you want in the table. You can specify each field nama and size and the kind of data that can be allowed into the field. There are a lot of complex ways you can define the tabla using other tables for input, but the most important thing ebout the process is figuring out what your data fields should look like before you ever turn on the computer."

"Like figuring out the parts layout on a circuit board before you do the wiring," Bob observed.

"Exactly like that. After you use DEFINE to set it up, you start hooking it all together with a command called CREATE. You tell the program you want to create records in the table, and it asks you for each data field. If you don't enter the same kind of data in each field that you told the program you were going to use, it refuses the Input end asks you again. I hope you understand that there are many options under each of these commands, but I am giving it to you simple."

Bob nodded his head and waved a hand, so I continued.

"Getting the records into the database can be a tedious job, but once it's done, the information in them can be retrieved in a lot of different ways. Oh, this is good! I see here that KnowledgeMon has the power to sort the records in the table and to build an index."

"Why is that so good?" Bob asked with more than everage interest.

"Well, if you put the records in one way, say maybe by the date you received the information, you might find that you want to get it out in some other way or maybe by lest nemes. So you can re-sort the whole database by last name once and make all of the future requests for data go much faster.

"If you build an index, it is like a map. When you make a query into the system, it looks at the map instead of examining each record. This really speeds up searches, but you have to rebuild the index whenever you add data. Both sorting and index building take time."

"Would a RAM disk help?" Bob asked. "I've got plenty of memory."

"Yes, KnowledgeMon will run well with a RAM disk, but you will either need at least 512K of RAM or a small database. This program has a lot of files and it is big, but it would be a natural for hard disk.

"Assuming you have the records in the table, then your next job is getting the data out in whatever format you need. The easiest thing to do is to get records out the same way you put them in, but that doesn't really use the power of the program. You could use 3 by 5 cards for that kind of simple storage end retrieval. The real power of any DBMS is in its ability to pull out data the way you want it according to the characteristics you specify. You use a command called SELECT to pull out data according to any sequence you need. You can put the selected data into a table and then make further selections from there. An experienced DBMS programmer can use the SELECT command to work magic. You can filter selections by using 'greater than' and 'less than' comperisons and lots of other fectors.

"If you want to do math, there are a lot of statistical functions built in that can take averages, sum figures, and do other computations."

"You make it sound pretty simple," Bob said with genuine interest.

"It's almost as simple or as herd as you make it," I replied. "You can literally put man-years into making a complex database with lots of references between tables, statistics, and reports. But if you want to keep track of a simple list, then it isn't hard to use at all."

During this explanation, Bob had fiddled with his soldering tools and paced around tha room. Now ha seemed to be struggling for an approach. "I need you to help me figure out what program to use. This KnowledgeMon thing looks pretty powarful, but mayba not too easy. I nead to get some fast results."

What's Your Application?

I laaned back in my chair and sat tha rather haavy KnowledgeMon manual asida. "Well, as we usually say to our customars, what's your application? What do you want the program to do? Tell me that and wa can figure it out."

Bob wouldn't look directly at me. Ha kept his eyas on his scarred knuckles as he slowly foldad and unfolded a scrap of conductiva foam. "I have a friend" he said, "who has a big bunch of items to catalog—maybe 2,000. Each item, a record I guess you would call it, has about ten data alaments—umm, you called them fields?

THIS KnowledgeMan thing looks pretty powerful, but maybe not too easy.

Well, each record will have about ten fialds. Sh . . . , my friand naeds to get tha information out in about three or four different ways. My friend also needs printed reports on at least a weekly basis."

"Hay, Bob, I thought we were partnars. This sounds like a good client. You aren't going off on your own, are you?"

"No! . . . Wall, yes, but not really. I mean, I'm not getting any money for this, but I don't need much help. Just tell me what program to use."

"OK, let's sae how KnowledgeMon compares with some other software, and maybe wa can get an idaa of what program will meet your need. I think you could use any one of sevaral programs. Let's look at dBase II, 1-2-3, and KnowledgeMan, and see how they fit your job."

"I can usa 1-2-3," Bob said defensively, "but I thought the database would be too big."

KnowledgeMan Technical Specifications

Records per table	65,535 max
Charactars par record	63,535 max
Fields per record	255 max
Characters per field	65,535 max
Numerical accuracy	14 digits
Command line length	unlimited
Indexes per table	unlimited
Index key length (characters)	65,535 max
Tablas open at onca	unlimited
Elemants per screen or printed form	unlimited
Program length (lines)	unlimited
Security code combinations	65,536 max
Rows par spreadsheet	255 max
Columns per spreadsheet	255 max
Foreground, background colors per screen form	8 max
Control breaks	unlimited

Note: practicol limits ore o function of RAM size, disk storage copocity, etc. —F.J.D.

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"No, if you use e mechine with e big RAM, you can get up to 2,048 records into each table with 1-2-3. You can get 256 characters into each of 256 fields in each record. Is that enough?"

"Yeah. Most of the fields will heve only eight or ten cherecters in them."

"Good. So 1-2-3 still fits. But KnowledgeMon, by tha way, will give you 65,535 records. You can put the same huge number of cbarecters in eecb field, end you can bave 255 fields in eech record. dBose *II* allows only 32 fields par record, but you can have tha same 65 thousand records in e table as KnowledgeMan. Of course, if your fialds were any size et all, you would need a bard disk to use all of the records the bigger programs will ellow.

"You remambar i mentioned sorting end indexing earliar wban wa ware going through the manual? Those are pretty useful if you are going to make frequent inquiries into the detebase. dBose *II*, 1-2-3, and KnowledgeMan all can sort tha tables, but it looks as if KnowledgeMon is unique because it can do logical sorts based on multiple fields. Thet means you can write e little command line with conditions in it and tell the program what to do with data under a couple of different conditions, instaed of just sorting it into some kind of numeric or alphabetic order.

"1-2-3 breaks down in the indexing function. It doesn't index. *dBose II* lets you build one index, but KnowledgeMon lets you build as many special indexas as you want. That means you can really fly through the retrievals. Of course, 1-2-3 is fast because it is all assembly language, and the data is in RAM, but for frequant retriavels against a big database, e speciel index is the way to go.

Statistics and Spreadsheets

"One other important factor I mentioned before is statistics. If you want to generate any reports on the dete, like the number of times something heppens or tha average of a velue, then dBose *II* is practically out of the picture. It hes no real stetistical power built into it. But aither KnowledgeMon or 1-2-3 can give you counts, standard deviations, and all kinds of things."

BEST OF all, it will give you color spreadsheets.

"You mean counting and summing isn't found in every progrem?" Bob almost smiled for the first time since he came in. "Why, I could do thet with a couple of latches eesy. I thought you software guys had all of this powarful stuff. You can't evan count?"

"Yep, that's the way it is. Some DBMS packages have to go through all sorts of speciel progremming contortions for functions like ganeral accounting. 1-2-3 and KnowledgeMon have the strongest statistical capabilities of any microcomputer detebase menegers on the market today."

Bob still looked like I hadn't helpad him much. Then he said, "You know, ona thing that would be nice would be a spreadsheet so she . . ., I mean, so my friand could see the dete and than changa some of the factors to show different buying or selling figures."

"What does your, ah, friand, buy end sell, Bob?"

"Well, ah, wine. Wbolasala. Buying from the little wineries in New York end Ohio end selling wbolesele to gourmet and speciality stores. Lots of inventory on paper, but not much profit."

"Hmmm. You're sure this isn't a potantial client for both of us? Sounds lika wa could both profit e little."

"No! I mean, no. There really isn't any profit to be mede. Believe me."

"I believe you, I baliave you. You want a spreadsheet?"

"Yeah, but that means I either hava to use 1-2-3 or else some kind of special format translation scheme to translate the data for a spreadsheet if I use dBose *II* or KnowledgeMon, right?"

I reeched for the KnowledgeMan documentetion again. "I'm not sure. I saw something ebout spreadsheets in this binder."

I checked the index in tha manual and found the right saction. "Hey, look! KnowledgeMon has e spreadsbeet! You don't have to use the spreadsheet format for your DBMS as you do with 1-2-3, but it's thara if you want it. The KnowledgeMon spreadsheet isn't as big as 1-2-3's; you can hava only 255 rows. But it gives you 255 columns just as 1-2-3 does."

Comparing Bens and Whistles

I read further and said, "It also has e couple of neet tricks, such as the ability to complately erese the bordars, and it bes the ability to write procedure statements. You can give it IF-THEN-ELSE, TEST, WAIT, and e lot of other commends so thet the spreadshaat can becoma intaractive with the user. That procedure control is powerful. But, best of all, it will giva you color speadsheets!

"The cells in the KnowledgeMon spreedsheets can be displayad in various colors, and the colors can be changad according to the value of the cell. That means you can really show what it means to be in the red! Boy, is this neat."

"You mean that the color generator is under software control, and even individual cells can be controlled by some kind of

The KnowledgeMan spreadsheet is not as easy to use as some, but it has features no others can offer. The color highlighting of certain cells can also be accompanied by blinking and the sounding of the bell. The spreadsheet can be displayed without the borders to reduce the clutter. This is particularly useful for interactive applications using the procedure control commands.

program description about whet's in them?" Bob reelly was smiling now.

"Yep. But even with all of those whistles it still looks pretty easy to use. You have a good simple copy command for cells, end you can manipulate renges of cells. But it doesn't look as if it hes 1-2-3's point function. I like to point out the cells. But it is e really good integration of spreadsheet and DBMS."

"Does it have graphics?" Bob esked.

"No. 1-2-3 is ahead of it there, for sure. KnowledgeMon doesn't have any graphics functions. You can send the dete out in just about any form for a graphics program to work on, but it doesn't do graphics itself."

Sensing e solution, Bob became less a puzzled client end more a logical engineer. I could tell he was back in his professional role when he started his summery. "So 1-2-3 puts more emphasis on grephics while KnowledgeMon is stronger for large detebase applications. They both heve spreedsheets. 1-2-3 has e lot more help commends and is easier to use as a spreedsheet, but KnowledgeMan hes color. Is that it?"

"KnowledgeMon has e much better procedure control capability if you ere writing interactive epplicetions for novice users."

"Ok, we might use that here."

A Very Special Application

"Oh, now, weit e minute. What's this we stuff? I thought you just wented to know whet program your friend should use."

Bob wes all business. He wesn't going to be pushed now that he had some usable elternatives. "I'll tell you whet. I'll pay you for your time et the usuel rates we set for good customers.

"I thought you seid there wasn't any money in this."

"There isn't; I just want to help my friend out. You can understand that, can't you? I mean I don't have to put thet into en IF-THEN statement, do I?"

"Now, Bob, don't build up harmonics in your oscilletor. Sure, I'll help you. We can talk about pay later. Maybe I'll do it just for the experience of getting to know KnowledgeMon. But I'll want to talk to this friend of yours so thet I can see what kind of epplications the guy really has."

"Yeah, well . . ."

Bob never finished his response because the phone rang. He jumped straight up and then went for it, but I reeched it first. My "Good morning, 2D," brought a response from a charming female voice asking for Robert.

"Umm, Bob, I think it's for you. Miss Sally Langley from something called Finer Spirits."

As Bob fumbled with the phone, the picture clicked together in the manner of e KnowledgeMan screen. My slightly introverted friend with hardware for a heart hed e reelly speciel epplicetion in mind. I had e feeling I wes going to find out more about fine wine, Sally, end KnowledgeMan than I had ever suspected. */PC*

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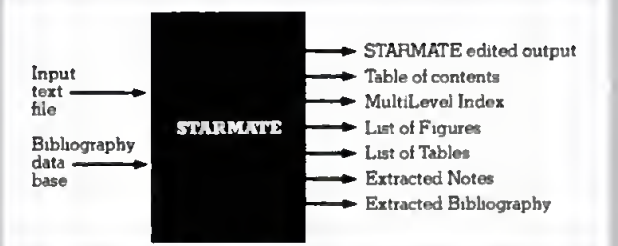

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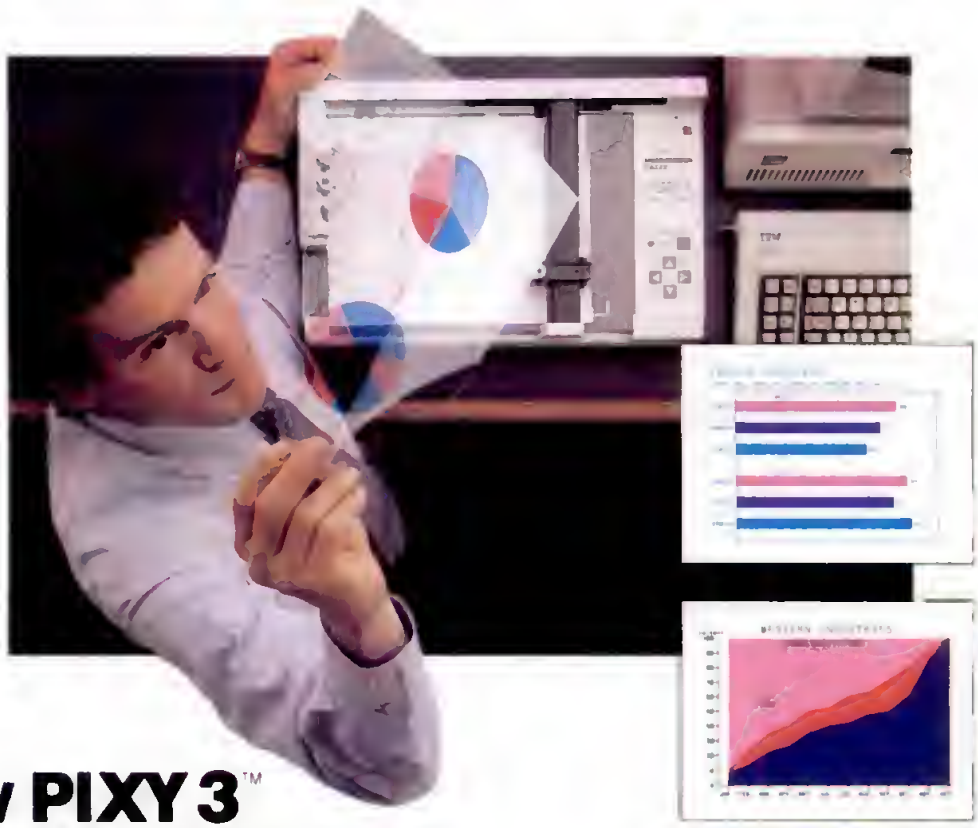

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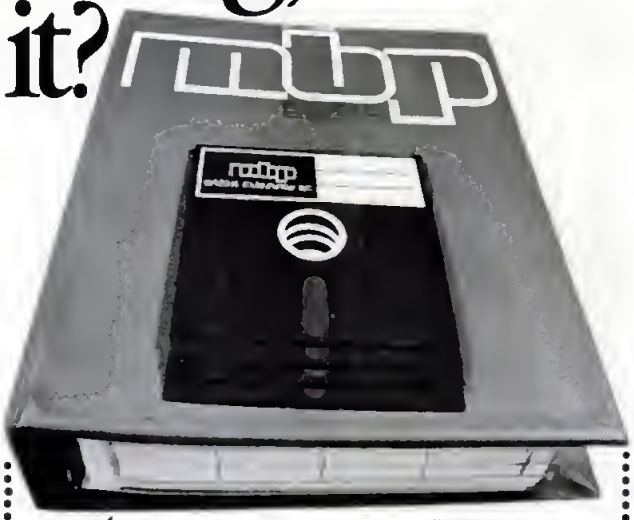

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Contrary to a thousand predictions, the printed word shows no signs of becoming extinct. With PC-generated print, the focus is on quality.

Putting It On Paper

Photograph courtesy of Dataproducts

Figure 1: A typical matrix printhead.

The great electro-computer revolution has come and stayed, but most people still prefer to receive computer output on paper rather than directly through an RS-232 interface. The truth is that, despite the best efforts of computer engineers, technicians, and magicians, human beings remain more paper-compatible than PC-compatible, and no amount of prying inside memory chips and shaving away at the edges of the copyright laws promises to change this situation.

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HUMAN beings remain more paper-compatible than PC-compatible.

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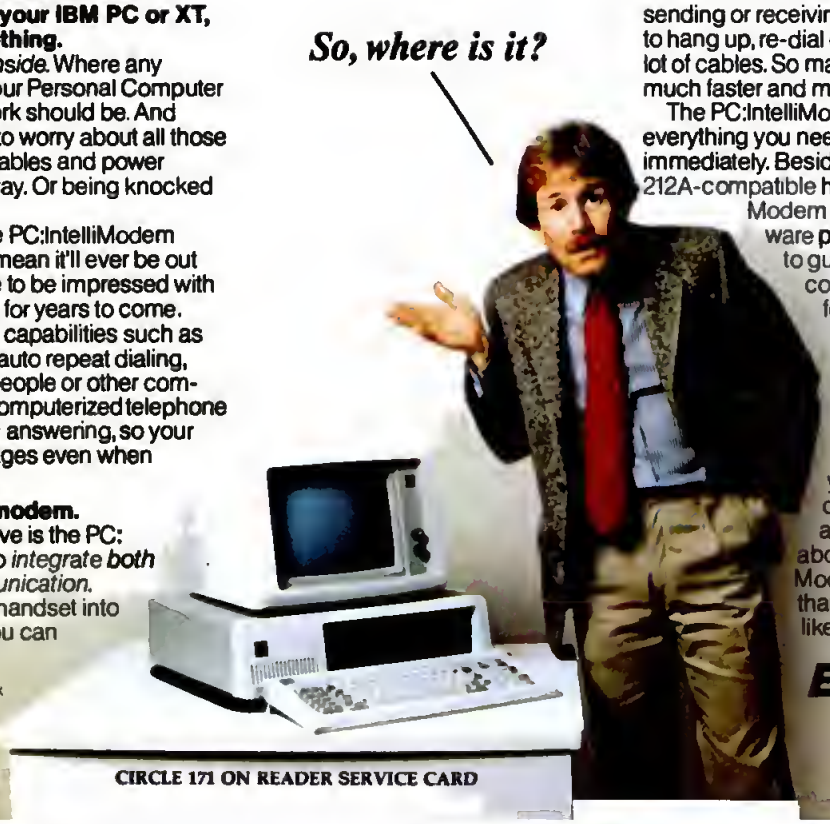

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neric copy output device." In fect, printers come in more flevors than ice cream—hundreds, possibly thousands of different models—and they are as different from one another as plain vanille is from strawberry chocolete chip galato. As with every flavor of ice cream, something good can be said about each printer (if you try hard enough), and even the best printers can be critically reduced to insignificance if your spirit so moves you.

In truth, no single computer printer can do everything well. Some are designed particularly to be bolted to the far end of number-crunching systems, to decorate reams of papar with column upon column of computer-crushed calculations. Others are keyed to a simple sort of mail fraud, making every parsonally addressed form letter appear to have been individually considered and hand-typed. Still others aim for the simple virtue of frugality, trying to be the cheapast of all possible methods of getting computer-driven ink onto paper.

The best way to find your favorite among printars is to try each and every one. If neither your calendar nor budget allows this luxury, the next best way to identify the right printer for you is to make an informed choice based on e knowledge and understanding of how all printers work, whet mekes the various types different, and which ones suit eech particular application best. Classifying printers takes more imagination end perseverance than unraveling e murder mystery, and each of the pleyers deserves to be regarded with just as much suspicion.

Printers cen be dividad into saveral stereotypical, overlapping categories based on tha mechanical procass usad to get ink on paper (impact versus nonimpact printers, with various subclasses); the volume of type (character, line, page) printed et e time (seriel, line, or page printers, respectively); the quelity of the charecters (letter quality, correspondence quelity, draft quality, and dete processing quallty); and the method used to achiave that print quelity (metrix versus fully formed character printers).

To Strike or Not to Strike

The most familiar variety of printer is the impact printer, which works on the same principle as a typewriter: A hammer of some kind strikes e ribbon (cotton or nylon) soaked in ink or e ribbon (film or Mylar) coatad with ink, which then strikes the paper. The impact of tha hammer egainst tha ribbon forcas ink onto tha papar. It also makes noise. And although some noise can be expected from ell mechanical devices, the rettle of the hammer/ribbon/peper impect is perticularly loud, espacially when compared to tha hushed whir of nonimpect printers. On the other hand, impect printers are reassuringly familiar and straightforward. Genarally, thay do not require special peper for printing. Furthermore, the impact is sufficient to make multiple copies et a time using carbon peper or carbonless multiple copy forms.

CLASSIFYING printers takes more imagination and perseverance than unraveling a murder mystery.

The femily of nonimpact printers, which reads like e catalog of twenty-first century technology, includes electrosensitive, ion deposition, magnetic imaging, thermal, ink-jet, laser, and photographic-based printers. The different operating principles involved prevent me from making generalizations about nonimpact printers, othar than the observation that they do not strike the peper with hammers. Tha more accessible—that is, more affordeble—mechines do share some common characteristics: reletively quiet operation and inability to maka carbon copies.

The more common nonimpact printers work by eltering the surface characteristics of a specially treated paper either by heet (thermel printars), by alectricity (electrosensitive), or by light (photographic). Although the use of treeted paper usually ellows for mechanically simpler mechanisms, the special papers are sometimes difficult to obtain, particularly preprinted forms or letterheads, which limits many of the business applications of nonimpect printers.

The more exotic nonimpect printers are designed to meet specielized needs: extremaly high output or extremaly high quality, for instance. They might be used

Figure 3: The daisy-wheel print mechanism. The petals can be bent upward to form a "thimble."

Photo courtesy of Diablo

in the data procassing department of a major corporation or in a phototypesatting plant. Generally speaking, these printers ara axpensiva.

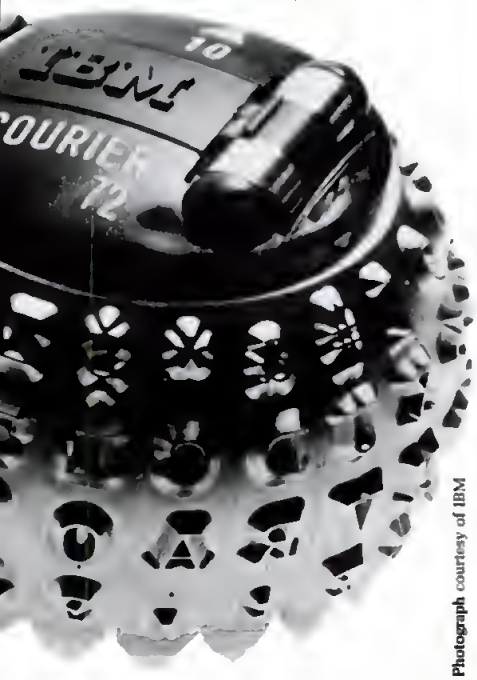
Connecting the Dots

Matrix, or, more commonly, dot-metrix, printers typa tha on-pepar equivalent of e television image, or e newspeper halftone pbotograph. Eacb charactar is broken into e collection of dots, which, combined, epproximete the shape of the lettar or number. The term motrix originated because eecb dot is positioned et e specific position in e grid arrey, or metrix, for a given character. As with helftone photographs, the printed characters from matrix printers are e little rough et the edges, and imege quality varies with size end number of dots in a given aree. More dots closer togathar yield e more solid-looking charecter with greater legibility.

Although the work of matrix printers may not be es eesthetically pleesing es thet of fully formed cbarecter printers, matrix printars have a singular edvantege: The typefece can be altered by changing the software. Since the cherecters are formed out of dots, and the dot pattarns ere computer controlled, charactars can be mede wider or nerrower; they can be italicized or mede boldfece just by changing the pattern coded into the printar's mamory. Many of the newer matrix printers even ellow the user to develop end print bis own charecter sets.

The most common metrix printers use en impect print mechanism. Each dot is formed individually by a tiny single hammer, actually e wire, striking e fabric or plastic ribbon, which then transfers ink to the paper. Typically, a seemingly complex, but efficient mechanism controls the wire. A spring forces the print wire toward the peper, but most of tha time the wire is beld back by e strong permenent magnat. When e command from tha host computer indicetes that the wire sbould make e dot on the peper, an electromegnet is energized, which ganerates a field that neutralizes the permanent magnetic-rastraining

Figure 2: The IBM Selectric "ball" print mechanism. Most printers based on the ball concept ore relotively slow.



Photograph courtesy of IBM

Defining Print Quality

Some loose definitions of the terms manufacturers use to describe computer generated print quality.

Although the term *letter-quolity* was once synonymous with *fully formed* chorocter printer, the latest generation of metrix machines is attempting to upset the old order. The new matrix printers rightly claim correspondence or near lettar-quelity images. But tha terms are impossibla to defina. After all, cbaracters may be defined as anything readeble, end all too oftan, they don't even maet that minimal standard.

At leest there is e neerly accepted ordar to tha print quality hierarchy, stretching from data procassing quality at the bottom, through draft, correspondence, near letter quality, up to tha brass ring, true letter quality. Although ell of these levels depend on individual opinions, general working definitions can help decipher what printer manufacturers mean when they bandy these terms about.

Doto processing quality refers to matrix characters that are good enough for that mass of computer output no one seems to read. It is formed with a single pass of the printhead, so each character is shaped from easily discarnibla dots in a matrix measuring from 5×7 to 9×9 dots. Because of the wide spread of the few dots, the on-paper image appaers feint or gray, no mattar how fresh the ribbon.

Draft quolity is loosely defined as something readabla thet you would be embarrassed to show someone else. It implias word processing output of an early stege of e document suitable for proofreading or revision, but not for public display. Depending on the menufacturer, draft quelity might be creeted by e single pass of an 18- or 24-wire printhead, or by two passes of e 7- or 9-wire printheed. The characters are simple, most often without serifs, but dark. The dots are usually plain.

Although letters and correspondence should be of the sama quality, matrix printer manufacturers often draw e distinction. A reasonable working definition is that correspondence quolity is good enough to send to someone, but not good enough to meke the recipient think it was typed. The individual dots of each cheractar are hard to sort out. Usually two or more passes of the printhead are required to form tham, with tha papar being moved upward a tiny fraction of an inch betwean pesses so that the fresh dots will be placed inbetwean the pravious onas.

Near-letter quolity means you'll have to look twice to be sura that tha materiai wasn't typed. That is, typad on an antebellum typewriter sedly in need of cleaning and en overbeul. The density of the metrixed dots is so bigh thet individual dots ara not discarnibla. Serifs on each charecter ere fully formed, but blotchy. To achieva this quelity level, multiple pesses or meny wire printhaeds are usually necessary.

Trua letter-quality is what fully formed character printers produce end whet matrix printers can only aspire to. All charactars are sharply defined, with clean edges and serifs. The characters ere uniformly dark, and all are on streight, even lines. Quelity is so high that in meny cases, letter-quality cannot be distinguishad from typesetting. —W.R.

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effect on the print wire. Released from its magnetic restraint, the print wire is pulled by the spring's force to strike against the paper. Note that when the printer is turned off, all print wires are safely retracted by the permanent magnet.

THE SPEED of laser printers is astounding: Measured in pages per minute, rather than character per second, or line per minute.

A printhead consists of a number of these wires and their associated mechanisms. In typical matrix printers (which measure speeds in up to hundreds of characters per second), seven, nine, or more wires are arranged in a vertical column in the printhead. In a serial matrix printer, the printhead (see Figure 1), moves horizontally across the paper, and each wire fires as necessary to form the individual characters one nine-dot column at a time. Note that the print wires can be fired "on the fly"—the printhead never slows down or stops until it comes to the end of a line.

One of the primary factors that determines how fast any impact matrix printer can create characters on paper is the time between successive strikes of the print wire. Physical laws of motion limit the acceleration of the wire (and hence speed at which it can move). Therefore, barring a repeal of the laws of nature, a great increase in speed is impossible. The time it takes to retract and reactuate each print wire limits how fast the printhead can travel across the paper: It cannot sweep past the next dot position before the printhead is ready.

One way around this speed limit is to combine more print wires and shorten the sweep of the printhead for each line. More wires firing within the same period means that more characters can be formed. Some serial matrix printheads have two columns of print wires, which can be used to print at twice the usual speed or to increase the dot density, resulting in a slower speed, but a higher print quality.

An increase in the number of print wires is the basis for high-speed matrix line printers, which can reach speeds of hundreds of lines per minute. Matrix line printers typically use a horizontal row of 132 print wires (rsther than e vertical column of nine) stretching across the entire width of a sheet of paper. For each full line of characters, the printhead moves over only five or so dots, then the paper is advanced one full line, and the printhead starts typing the next line of text.

Matrix characters can also be formed without impact using ink-jet, thermal, laser, and related principles.

Ink-jet printers literally spray dots of pigment onto the paper from a row of tiny nozzles. Although the first ink-jet printers were high-speed line printers with a long horizontal row of nozzles and high prices, the latest serial ink-jet machines rival many of the serial impact machines in both speed and cost. Although the more expensive machines yield good character quality, the lower priced ink-jet printers create text that can only be classed as data processing quality.

Electrosensitive and thermal printers create matrix images by using special printheads with multiple styli. The styli physically contact a special paper, which is treated to change color (usually to darken) upon the electrical or heat action. Although inherently quiet, reasonably fast, and relatively inexpensive, these printers have not won wide favor because of their treated paper requirements. Furthermore, the on-paper images may be faint and hard to read, and the feel of the sheets may be displeasing. However, thermal printers remain popular as narrow-column devices designed for low-cost, hand-held calculators.

Pages per Minute

Laser technology has been adapted to high-speed printers. A laser beam is used to trace characters on a drum coated with selenium. Flashes of light change the electrical characteristics of selenium. Consequently, the exposed areas on the drum are given an electrostatic charge that attracts pigment and causes it to stick. Paper is then wrapped around the drum, and the pigment is thermally bonded to the paper. The operating principle is exactly the same as a photocopying machine—and the resulting hardcopy looks just like it came from such a copier. As in an electrostatic copier, nearly any paper, other than wax paper, can be used, including stationery and preprinted business forms. Legibility and print quality are high. (Although the characters are not fully formed, the matrix density is very high.) And the speed of laser printers is astounding: measured in poges per minute, rsther than character per second, or line per minute. Current machines aversge 20 to 43 pages per minute. Laser printers cannot make carbons, but they're so fast it may not matter!

Tradltionally, laser printers, like Xerox machines, have been large and expensive, tsble-sized rsther than tsble-top, with prices in the tens of thousands of dollars range. But as photocopiers have been shrinking both in size and price, so have laser printers. The first of this new generation—the General Optronics Holoscan 1 announced last year at $4,500—will fit on a desktop with a little room to spare and will flash out 28 pages per minute.

Ion-deposition printers work on a similar principle, but use ions (electrically charged atoms or molecules), rather than laser beams. ions are projected at the image-forming drum, which is typlcally made from hardened aluminum. Although not yet widely used, ion-deposition printers can be simpler and less expensive than laser machines because ions can be directed and modulated into the proper patterns using magnetlc or electrostatic fields, whereas shifting a laser beam requires optics.

AS photocopiers have been shrinking both in size and price, so have laser printers.

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1977	130	77	43	10	.631
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imege to be expressed is molded in metel or plastic, end can last for an extended period of time.

Impact fully formed cherecter printers work like typawriters. A raised, fully formed character is struck egeinst a ribbon, whicb then trensfers its exact imege to the paper. Each charecter to be printed must be moved in sequence in front of e hammer, wbich will strike it egeinst the ribbon.

ALTHOUGH fully formed character printers need make only one stroke to equal the dozen or so wire dots of matrix printers, they are generally limited to slower speeds.

Various schemes have been devised to move the charecters into position. Bell printars have the charecters arranged on the surfece of e sphere, which is shifted into the proper position so that a specific area on its surfece can strike the ribbon. Tha most common exemple is the IBM Selectric print mechanism (see Figure 2). Because the ball of type must go through more gyretions then a St. Vitus dencer, most printers besed on the ball concept are relatively slow—printing below about 12 cbarecters per second.

By rearrenging the characters so thet they are loceted near the perimeter of e wheel, the positioning mechenism can be simplified end sped up. Such "deisy-wheel" printers rotete the eppropriete character in front of the print hammer. Bend the petals of the daisy upward, end the result is a "thimble" printer (see Figure 3).

Although fully formed character printers need make only one stroke to equel the dozen or so wire dots of matrix printers, they ere generally fimited to slower speeds. To avoid smearing its impression, the printer must come to e helt before tha hammer strikes. This means the daisy wheel must stop spinning, and the carriege mechanism must settle down before enything gets on peper. It must then speed up egein to get to the next cheracter.

To achieve greater speed, fully formed characters ere rearrenged, often embossed onto e continuous band, which is driven between pulleys et very high speed, creeting a band printer. A veriation on the sema theme is the chein printer, where the imprinting cherecters ere on slugs linked together in e continuous chain.

Although you might expect thet printing could be sped up by mounting multiple bands or chains parellel to one another so that severel cheracters could be printed at once, more typically, the many perallel columns of embossed charecters are put

At The Interface

Before you connect a printer to your IBM PC, make sure you have the proper cable.

By itself, e printer does nothing but sit around and make noise. It has to be told by your PC every letter it is supposed to print. It receives its instructions either through e parallel or serial (esynchronous) port in your computer. The port is the software equivelent of a cable connector, a chennef through which ell communications with the outside world must be routed. A parallal port sends alf tha date bits of each ASCII cherecter (as well as some other signefs) through eight separate wires et the same time. A serial port sends the data bits one eftar another, (in a series) down e single peir of wires. Tbese two styles of ports have bean stendardized—welf, sort of.

The parallal port used by the IBM PC operates es an industry standard Centronics port, but in all its wisdom, fBM chose to use en entirely different connector than is normally expected at such a port. (Let's not be too quick to criticize. IBM edded some extra control functions to the standard, which can increese versatillty end convenience.) You must insist on the proper cable to connect your PC end printer. Once you've got a perellel port and thet proper cable in hend, plugging each end in will usuelly bring your printer to life.

Although there is e singla standard specifiad for the styfe of seriel port (the famed RS-232C) used by the IBM PC, the standard permits a wide arrey of variations, with different retes for sending data bits, end different ways of synchronizing signels end protecting egainst errors. If your printer is not set up to understand dete the same wey your PC is set up to send it—using the MODE command in PC-DOS—the resuft is garbled print or a stalled printer.

Because the IBM PC, or almost eny computer, is capable of sending dete many times fester then most printers can hendle, some means of praventing the PC from outdistancing tha printar is necassary. Ona way is to use a speed through the serial port that is sfower then the speed at which eny printer might be expected to ebsorb it, say ebout 300 beud (bits of date per second). But 300 beud is indeed very slow, and this can meen several minutes to send e full page.

Another wey to prevent data loss from the computer telking fester then the printer can listen is through hendsheking signals. Essentielly, the printer sends a signal to your computar, which indicates thet it bas as much deta es it can handle, end the computer stops sanding it until tha printar gives the signal.

Handshaking can take place through the herdware, most often vie en extra wire. The voltege of the wire indicates to the computar whather or not the printer is busy, usually through pin number 20 on RS-232 cables. Or, the handsheking can be through software, the two most common softwere hendshaking signals being ETX/ACK end XON/XOFF—eecb peir trensleting to "send me some deta"/"hold on for a moment, f'm up to my eers in date." If the hendshaking protocols used by the computer end the printer do not match, the result is usually e chunk of lost copy. Or, if only half of the bandshaka is felt, the result is the printing of e few words, sentences, or peregraphs, where no emount of coexing is able to get the printer startad egein. The exact amount thet the printer will type before stopping is one buffer full.

—W.F.

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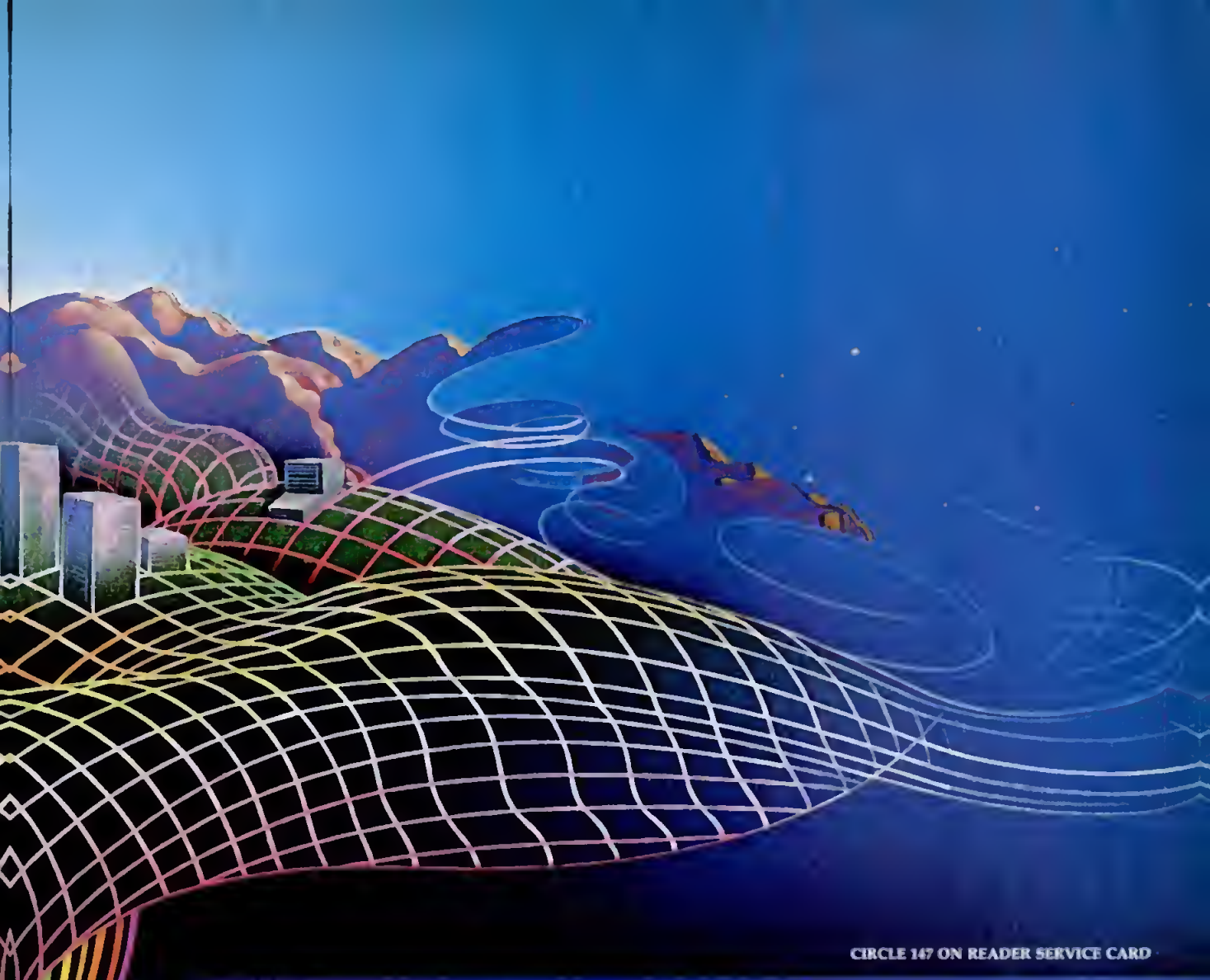

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on e single drum, creating s very high-speed, high-quality mecbine called e drum printer.

Most phototypasatting machines are varietions on the band printer principle. Rather than relying on hammer impact, in these machines s beam of light is shot through e rotating strip of photograpbic negatives of various charecters, exposing light-sensitive papar, which is then developed into picture-perfect hardcopy, which is used to make printing mesters. Of course, lenses are necessary to focus the images on psper, and by varying tha megnification of the lens system, different type sizes can be producad with s single image band. Because the negatives are generally larger than the final typeset letters, the reduction process results in very sharp impressions, producing an output of tha finest quality.

THE PRINT mechanisms of all machines must obey the laws of physics, which limit how fast parts can speed up and change direction.

All types of fully formed cherecter printers share s common characteristic: The typefece can be changed by swapping print wheels, balls, or bends. A reletively simple physicai operation, the swapping msy be done beceuse the print element is damaged, or because e different type face is desired.

The Inside Story

All types of printers fsll outside the categories described up to this point. They consist of half-moving and helf-thinking parts. The mechanical part is easy to acknowledge beceuse the result—characters on the paper—is so readily visible. But just as important is the printer's unseen "brein," which must interpret the instructions it receives from the computer. All that the printer is likely to receive is a string or clump of ASCII characters, seven or eight digital bits thet code 128 or 256, letters of the alphebet, numbers, other symbols, end speciel commands. From this scant informetion, the printer must figure out exectly where on the pege to print each individual letter.

Some computar programs, such as word processors designed to be usad with specific printers, make the job s bit easier. They may include special printer drivers that add extra ASCII code symbols to the dete streem telling the printar when to start a new line or how many fractions of an inch to move the printhead for eech character for proportional spacing. Other times, the printer must create order from cheos. It takes e train of thought thet exists electronically as a single lina and breaks it into separate lines, arrangas tha linas on the page, and provides the proper margins all around.

Usuelly, the instructions from computer to printer take the form of command codes and escepe sequencas. Command codes are extra individual ASCII characters that do not appear in print, but instead, give special instructions to printers and other computer-controlled devices. Two of the most widely used command codes are line-feed (LF) and carriege return (CR), which instruct printers when to roll up to the next line and when to send tha printhead back to the leftmost column, respectively. An escepe sequence is a string of ASCII characters that begins with the Escape (Esc) symbol, which is ASCII cheracter number 27 (in decimel). When tha printer receivas an Esc, it knows that the next ASCII symbols are not to be printed and are instesd instructions to do something: changa fonts, pitcb, or activata grephics mode. Although there is et leest one nearly standard group of escape sequences—American Netional Standards Instltute (ANSI) escepe sequences—nearly every printer manufacturer has broadened, edepted, or ignored tha standard to suit the speciai needs of its own printer. Hence, the command codes for elmost every printer are different. This is why you get stuck customizing WordStar and other programs to tske edventsge of all the special abilities of your multifeatured printer.

One major difference emong printers is how much independent "thought" each is capable of. The basic printer, the classic teletype, is so dumb that it doesn't even know when it comes to the edge of the papar, end would happily print an entire noval in one endless line unless otherwise edvised by the eddition of carriege returns and line feeds. At the other end of tha printer rainbow are those with built-in microprocessors, which rivel the PC in intelligence. Thase "smart" printers are capeble of teking over ell the text formatting thet your word processing program normelly handles. They can approprietely break text into lines, space characters proportionally, fully justify both the left and right margins, and supply the proper top and bottom margins to each page. The microprocessors built into most printers slso handle such mundane chores as telling the mechine which character on the daisy wheel to strike or what pattern of dot-matrix hammers to print in order to generate eacb specific letter on paper.

"Smerter" printers are usually fastar printers beceuse they can optimize the positioning of tha printhead or print wheel. Their "thinking" ebilities are supplemented by random access memory (RAM), which also adds built-in buffering capebilities from a few cheracters to e few pages, and can allow the printer to "think ahead." An ability oftan called "logic seeking" permits both faster bidirectional printing (one line forward, the next in reverse), and horizontal and vertical tabbing, whicb allows the printer to skip over oceans of blank paper without dwelling on each individual space.

The speed limitetion of any printer is caused by the mechenicel belf of the machine—tha actual mechanism, the bardware that does the printing. The print mechanisms of all machines, not just matrix printers, must obey the laws of physics, which limit how fast parts can

ALL TYPES of fully formed character printers share a common characteristic: The typeface can be changed by swapping print wheels, balls, or bands.

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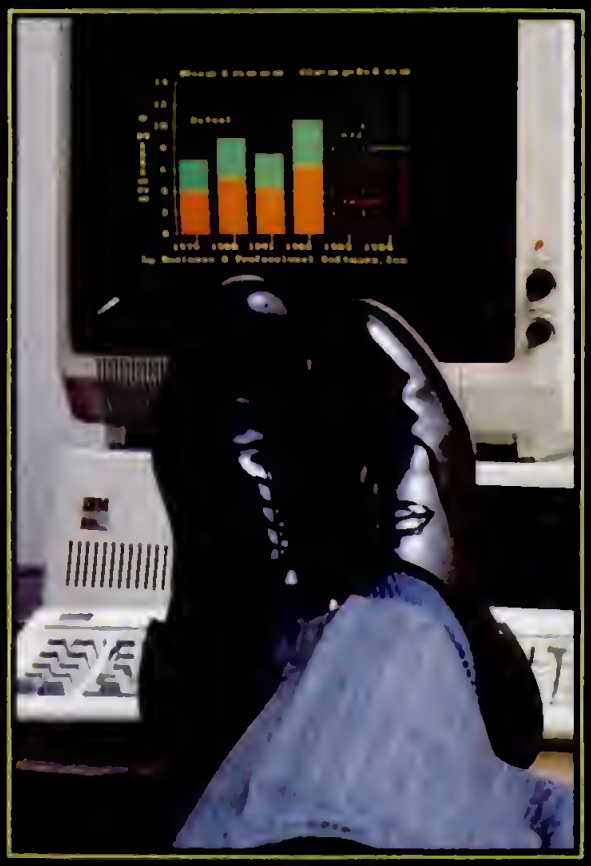

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speed up and change direction. A more powerful—and therefore more expensive—mechanism is required to speed up the print mechanism. The heavier or more massive the mechanism, the more power required to control its movement. To a large degree, the design and sopbistication of the mechanical parts determine the speed, the durability, and the maintenance requirements of any printer.

MOST sheet feeders are designed for single copies only, and carbons may cause conniptions.

Other Printer Features

The printhead is not the only part that moves in a printer; the paper must move as well. Various schemes have been developed to belp both the printer and its operator deal with this chore.

Friction feed is the simplest paper-moving mechanism. The paper is inserted between a large rubber roller (called the platen) and smaller rollers. Friction between rubber and paper keeps it from slipping. For the most part, loading is a manual operation. The operator inserts each individual sheet, lines it up to be sure it's straight, and then locks it down and signals the machine that all is well. Easy yes, but tedious should you decide to print your own retelling of *War and Peace*. You are also required to stand by and give the printer constant attention. On the positive side, however, you can use any standard paper, including your own stationery or preprinted forms.

An automatic sbeet feeder (occasionally called bin-feed) can relieve the tedium of the friction-feed mechanism. It permits the use of most standard-sized forms as well as plain paper. Unfortunately, since it is complex, it is also expensive—and will easily dig a multi-bundred dollar bole in your pocket. Most sheet feeders are designed for single copies only, and carbons may cause conniptions.

Pin feed and tractor feed rely on the familiar continuous form computer paper, with the sprocket drive boles on its border. Pin feed sprockets are permanently affixed to the edges of the platen roller and can only handle one width of paper. Tractors are adjustable to handle nearly any width paper that will fit through the printer. As the names imply, unidirectional tractors only pull the paper forward. Bidirectional tractors allow both forward and backward paper movement, which is sometimes belpful for graphic and special text functions.

A major difference among printers is the amount of control over paper motion each allows once the paper has been inserted lnto the machine. Some allow you or your PC to move the sheet by a fraction of an inch—as small as 1/96th inch, or even less!—at a time, while others, like typewriters, restrict paper movement to mechanically cogging between individual lines or half lines. Obviously, the typewriterlike machines do not permit alternate line spacings.

Varying degrees of control are available on the borizontal axis as well. Some printers (notably the Smith-Corona TP-1) mechanically cog between each character position like—you guessed it—a typewriter. On other printers, the horizontal spacing is software controlled (by the printer or your computer). Consequently, the character pitch (the number of characters per inch) can be changed or made proportional so that each *M* is not cramped and each *I* is not left out in the middle of a white field.

As the computer world has become aware that one word is only equal to one-thousandth of a picture, the graphics abilities of printers have become important. When graphics abilities are compared, matrix and fully formed character printers change places: Top graphic image quality belongs to the matrix machines.

Actually, two different methods can be used to generate pictures on paper. One method is block graphics, which means that images are broken into building blocks of simple shapes, like squares, rectangles, triangles, borizontal and vertical lines, etc. Each shape is coded with an ASCII bit pattern as if it were a normal printer character, and the printer merely lays down line after line of these block characters to make a picture. Although most often found in matrix printers, some fully formed character printers can use special printwheels to make block graphic images. Needless to say, block graphics look rather chunky because the building blocks are relatively large.

The other grephic scheme is dot-addressable or bit-map grapbics, in which every dot position that a matrix printer can put on paper can be specified as printed (black) or not printed (white). An entire image can be built up like a television picture, scanning lines several dots wide (as wide as the number of wires in the printbead) down the paper. The resolution of e dot-addressable picture tells how sharp it is, and is consequently e measure of quality. The more dots per inch of resolution, the better the image will look.

Printers are becoming more colorful, too. Many, like old-fashioned typewriters, have two-color ribbons, and use escape sequences to control shifting between them. Four-color printers go two steps further by adding extra bands of color to a single ribbon, by shifting among four individually colored ribbons, or by e combination of both techniques (one black and one multicolored ribbon). The pbilosopby behind the multiribboned machines is that you'll use bleck more often, end that only the color that is worn out need be replaced, not the whole thing. In addition to the basic four ribbon colors, additional colors can be obtained by printing one color over another, ell through software control. Note, however, that unless you're e software hacker, you'll need programs designed for these special machines to take advantage of their rainbow of features.

THE MORE dots per inch of resolution, the better the image will look.

This general classification of printers may have left you wondering about specific machines. For this issue, PC Mogozine rounded up T.K. and evaluated top-of-the-line dot matrix printers. Following, we'll talk about the advanteges and drawbacks of each, and conclude with a comparative chart. /PC

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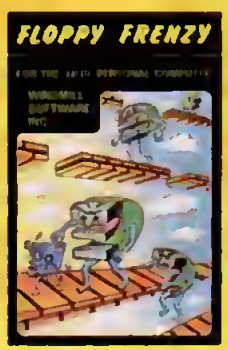

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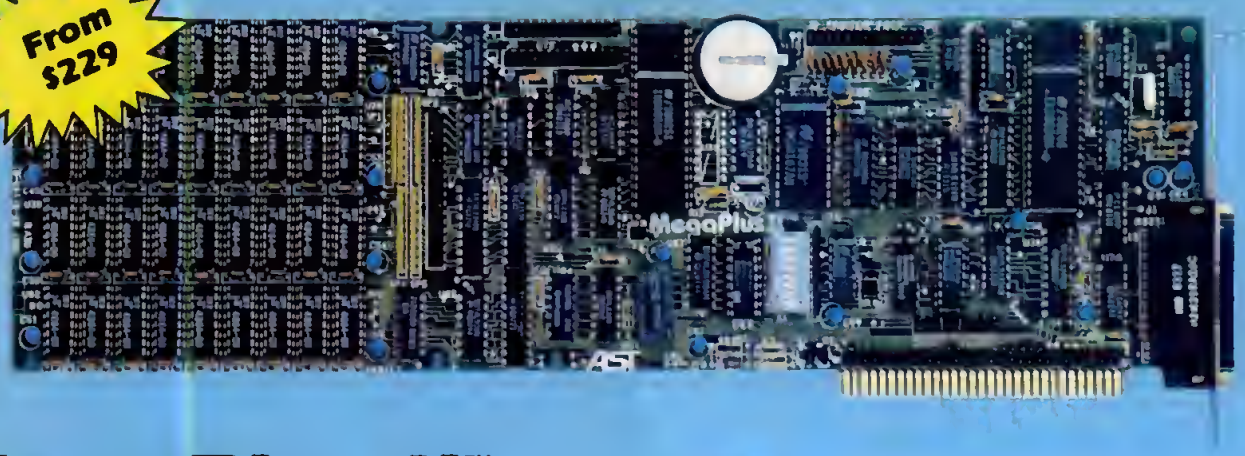

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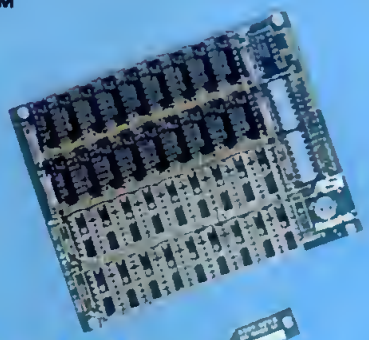
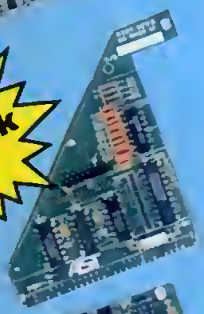
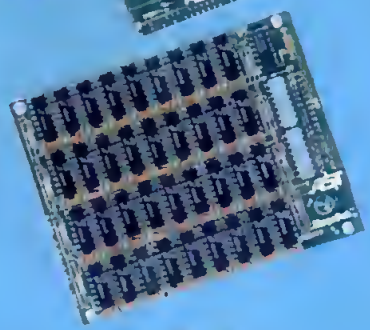


NEW GamePak





THE MEGAPAKS

The pictures show the optional 256k MegaPak™, the 128k version, and the new game pak. These boards mount "piggyback" on the MegaPlus II. The 256k MegaPak gives the old style PC's with only 64k the ability to add 512k of memory in one slot. The 128k MegaPak is for the new machines that can hold 256k on their PC's motherboard. This board along with the 256k on the MegaPlus II gives you the total of 640k, the maximum usable under 2.0 DOS. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have plenty of memory for your biggest programs. There is a new game port MegaPak option. It uses any IBM compatible joysticks or paddles. It plugs onto the pin connectors just above the edge connector so you can add one even if you have one of the memory MegaPaks.

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SuperDrive™ disk emulation software creates "disk drives" in memory which access your programs at the speed of RAM memory. SuperSpooler™ print spooler allows the memory to accept data as fast as the computer can send it and frees your computer for more productive work. Both programs are compatible with 1.1 and 2.0 versions of DOS.

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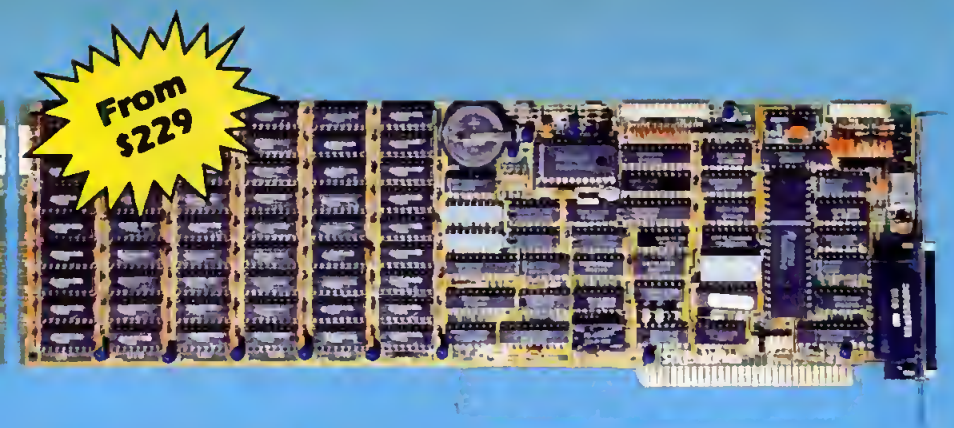

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Since the introduction of PC DOS 2.0, the capabilities of the PC have been increased with the ability to address up to 640k of memory. With the current PC having 256k available on the computer motherboard, you need another 384k to reach 640k. Great you say, but multi-function boards only have room for 256k on them. Enter the SixPakPlus™. Not only does it hold up to six banks of 64k parity checked RAM, but includes battery powered clock/calendar, serial port, parallel printer port, SuperDrive™, and SuperSpooler™ software standard. Optional is an IBM compatible game port. And of course you get the "Plus" of AST engineering and reliability, and the service and support of the largest dealer in the world for AST products.

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CIRCLE 137 ON READER SERVICE CARD

Have the new dot-matrix machines redefined the term "letter quality"? PC Magazine knocks out the walls to make test room—and discover some answers.

A Plenitude of PRINTERS

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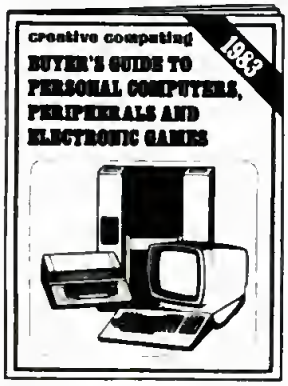

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In the early days of personal computing, claar-cut lines and the letters *IBM* divided hobby computers from business meinframes. Back then, a computer printout wes instantly identifiable by its wide sheets, perforated edges, green bars, and of course, the scattering of tiny dots from the matrix printar. Tha term *letter quality* meant merely legible and dot-motrix wes e synonym for eyestrain.

But as technology has movad forward, thasa distinguishing marks have fallen by the waysida. Certainly, the old, slow letter-quality printers are still clanking ebout, but e new breed of mechina is trying to cleim that title as its own: tha advanced dot-matrix printar. By laying dozens of dots where no more than a few used to fit, these new printers produce danse, bleck characters, which come ewfully close to looking like those printad by tha daisy wheels. Top quality appaarance is not always necessary, so at your computer's commend, these new mechines can revert to thair old ways and showar the paper with reletively loosely spaced dots.

These naw printars claim to be tha bast of tha breed, the top-of-the-line matrix mechinas that can handla any job, giving the best of both worlds: latter quality and high speed.

Whether the print quelity of these advanced matrix mechines will avar reach the standards that have been cleimed is a mattar of opinion. Soma critics regard such claims as pretentious, saying thet the edvenced dot metrix machines deliver too little for too much. Yet others believe the whole is greater than the sum of the dots, thet the dense matrix letters linad across tha pege look as good as, or better then the letter-quality output of any typewriter.

PC Mogozine decided to see for itself. We attempted to round up the best of whet was available. Our selaction critaria were simple: Editorial assistant Karen Cook called avary printer manufecturer we could find and asked tham to sand thair top-of-the-line machines. We herded the digital Gutenbergs into the *PC* offices and set to our task.

This evaluetion is much more then e mere listing. We got our hot littla hands on every one of the machines reviewed here, and ran them through their peces. Our tests ware not completely exhaustive. Finding all of tha features of a single one of thase mechines—lat alone tasting and thoroughly evaluating it—might have takan months. In the coming months, we'll present in-depth studies of a select few. Our goal, than, was a briaf test of performance relativa to the purpose for which the machine is primarily intanded: printing. Meny of these machines extend far beyond mere sufficiency, turning their happy owners into ecstatic ones. Nearly ell heve graphic capabilities; two are blessed with multicolor capabilities. Our primary concarn, though, was how well these printers actually print.

MANY OF THESE machines extend far beyond mere sufficiency, turning their happy owners into ecstatic ones.

Not all manufacturers we contacted elected to participata in the test. Some did not have evaluation mechines availeble; others seemed afraid of making a bad showing. Nonetheless, what follows is more than a representativa sample of tha latest generation of the best matrix impact printers.

Notes on Test Procedure

The task of describing or rating the print quality of any one of tha edvancad dot-matrix printers is somewhat subjective. So, in eddition to reporting our findings, we'll show print samples from each of the machines tested. Examina them and draw your own conclusions. How near the letter-perfect goal do they actually come?

Speed is perheps the biggest cleim of every one of these dot-metrix machinas. We tasted tha speed of each printar in both its fastest mode and its highest quality mode. Note, in the comparative chart that eppears et the end of this article, that our measurement and the manufecturer's claim are nearly always at variance. Far be it from us to eccuse our advertisers of exaggeration. Rather, we suspect that each made its measurements under the best

Figure 1: The test sentence thot wos used to judge the print quolity of each mochine. Most of the print samples were token from it.

```
The quick brown fox jumped over the lazy dog's back.

0123456789  Hell-o, Mom!
```

possible conditions—downhill with a tailwind—wherees our figures represent the performence you might axpect with actual use (which, to some manufecturers, may constitute the worst possible conditions).

Our speed test was a version of the *PC Mogozine* printer test, which was used to evaluate word processors (Volume 1 Number 7), modified by technical editor Bill Machrone to measure real printing speed, rather than how long it takes to fill each printer's on-board buffar memory. Our test sentence, from which soma of tha samples are takan, should be familiar (see Figure 1). The infamous words contain every letter of the alphabet (as well as e personal messege to my mother).

Our results of printing speed tests are not an absolute measure. Rather, thay are an indication of reletive performance of these printers compared to the others we tested. All were tested with the same copy under the same conditions.

THE DENSE matrix letters lined across the page look as good or better than the letter-quality output of any typewriter.

The noise measurements are also reletive indicetions of sound level. In our test procedure we used e Radio Sheck sound level meter ("A" weighting, "slow" response) maesured from about 1 metar away from the printer, with measurements from two axes averaged. Our test procedures simuleted e normal office environment, In that we made our measuremants in a more-or-less normel offica. Note that the ebsolute level is not critical. Wa used the identical measuring scheme for eech mechine, so the figures indicate tha relative noisiness of thasa machines.

Nearly every manufecturer warns that its printheads may get hot and cause burns if touched. Not only is high temparature a potential danger to those not haading the warning, but it gives a vague indicetion of printheed lifa. A harshar environment mey shorten life expectency. We meesured the risa in printhaad temparatura after 5 minutes of printing et the highest possible speed. A Keithley digital tharmometer/multimater modal 132 was used. The test period is short, but representetive of an everaga job—a few letters or peges of figures. Few of the printheads were more than warm to the touch after the test. However, after extandad use, printhead temperetures are likaly to soar.

The accompanying comparative chart gives both test results, as well as selection specifications teken from each manufecturer's data sheet or menual. The faetures listed are not exhaustive. For instanca, all machines with dot-eddressable graphics can be expected to have line spacing, which is programmeble in fractions of an inch besides the standard 6- and 6-par-inch spacings. While our comments highlight our impressions end point out whet we felt were the important faatures of aach mechine, we recommand thet you use our views not as the final word, but rather to help narrow your saarch. Your dacision on what to buy should be made only after you try out the printer in question to confirm that it meets your requirements.

Anadex WP-6000

It may take a lifetime to explore what's hidden inside the hulking pyramid of the Anadex WP-6000. It hes typefeces galora, faatures to turn the humblest datastream into fully formetted, proportionelly spaced, justified documents, and evan spacial tiny charactars for subscripts and superscripts. In fect, the WP-6000 holds the potential for crushing its competition, if just by waight alona (62 pounds).

The haart of the Anedex is en 18-wira printhead that doas in a single pass what takes most printers two. This transletas into e vary reedeble high-speed typeface, and an ability to put near letter-quality characters, as well as dot-eddressabla graphics, on paper at e rapid pace.

IT MAY TAKE a lifetime to explore what's hidden inside the hulking pyramid of the Anadex WP-6000.

The print resembles what you might get from a vintage IBM Executiva typewriter that has e cotton ribbon and is chronically in need of cleaning. Anedex describes it es "correspondance quality." (Note that the lebels assigned to each of the print samples ere the menufacturer's, not PC's.) The charactars are fuzzy and e bit uneven, the serifs wide end clumsy (see Figure 2). Then egain, tha Anedex will print half a line by the time one typewriter key has made the roundtrip to paper and back. Furthermore, it will switch between fonts in less time than it takes to turn the Executive on.

WordStor lovers will be happy to nota that one of the WP-6000's spaciel featuras is Diablo 630 emulation, which maans that by flicking e switch, the WP-6000 will impersonate the Diablo 630 (one of the few mechines blessed with Micropro's approval) and bring to life a slew of special faatures without poking around in Debug. Unfortunately, in our short en-

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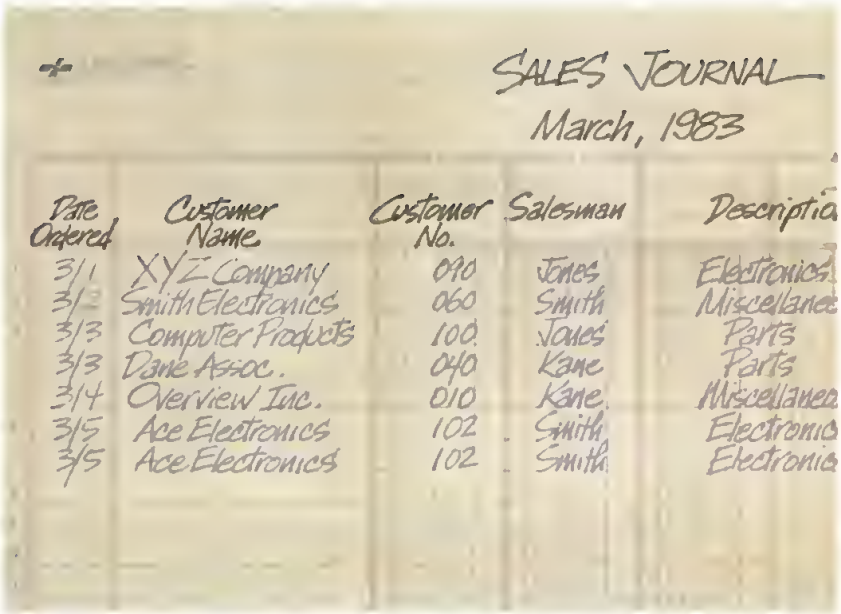

SALES JOURNAL
March, 1983

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3/2	Smith Electronics	060	Smith	Miscellaneo
3/3	Computer Products	100	Jones	Parts
3/3	Dane Assoc.	040	Kane	Parts
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3/5	Ace Electronics	102	Smith	Electronic
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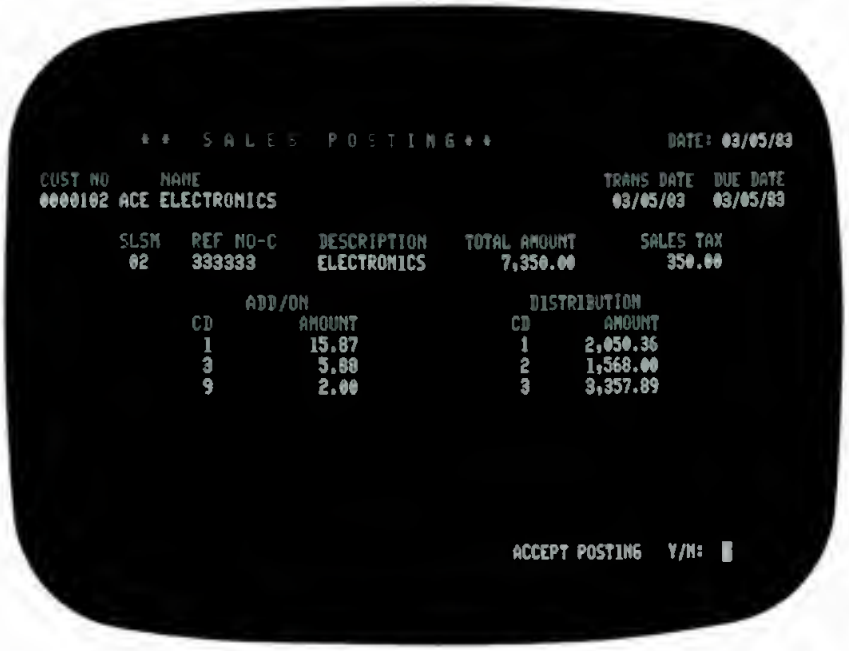

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countar with the Anadex, we navar got the emuletion to work properly—it turned the text to gibberisb.

Perhaps one reason for our failure is that Anadax seems to have cornered the market on DIP switches: There are enough to fulfill tha fantasies of any dadicatad diddler. The numbar of DIP switches is sufficient to allow the WP-6000 to talk to and understand elmost any serial data format or standard Centronics parallel input, to double for software escape sequences, and to control most of the printer's functions.

Three letter-quality type fonts are standard. Others mey be downloeded or eddad as read only memory (ROM) chips, which are eveileble optionally from tha manufacturer. Eacb typeface can be refined by proportional specing (at some print speeds), italicizing, and double-width expansion. By eppropriete escape sequance instruction, text from e raw detastream can be right- or left-justified, or both, as wall as centered. By varying the speed at which the printhead skatas across the papar, four levals of print quality can be achieved. As described by Anadex, thay are letter, correspondenca, draft, end dete processing.

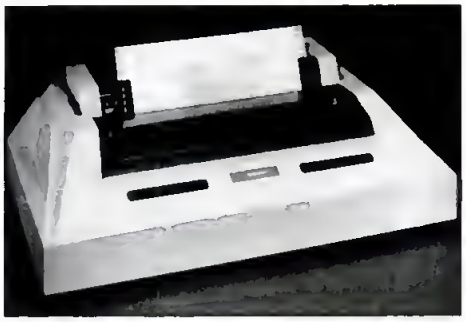
Although design is mostly a mattar of taste, the quesipyramidel sbape of the WP-6000 emphasizes the mess of the machine. And that's not the only raason you won't want to share offica spaca with it: The Anadex was the noisiest printar tasted.

Aesthetics aside, the mechanical nuances seemed well worked-out. The unidirectional tractor was a breeza to install and blended with the overell styling of the WP-6000. We found paper easy to load from the raar, although the printer also accepts paper through the bottom. We did not receive the optionel sheet feeder to evaluata.

Tbe two control panels on eithar side of the machine front heve small, squara pushbutton switches with genuine tactile feedback. On tha right side, separate buttons are conveniently provided for line faad, form feed, and top-of-form. The laft side adds pushbutton controls for mechanical edjustments such as print density end gep set. And just in case you're old-fasbloned, the pleten knob extends out the right side of the pyremid to move the paper around.

Dataproducts M-100

A large workhorse printer, the Dataproducts M-100 offers e good combinetion of speed end print quality, which is achieved by using e 14-wire printhead. However, it will never win a throughput race, and its print, though called "letter-quality," by Detaproducts, is still unmistakably dot-matrix (sea Figure 3). Only two type fonts, 10 pitch and 16.7 pitch (both sans sarif), are included as standard equipment. The charactars thamselvas are generally square, but mucb mora readable than thosa of the single-pass savan- and nine-wire printhead metrix mechines.



Anodex WP-6000.

Datoproducts M-100

The following print samples ore shown in normal size type and magnified opproximotely 600 times to emphosize variotions in print quolity.

*Figure 2: "Correspondence quolity" print sample from the **Anadex WP-6000.***

*Figure 3: A "letter-quolity" print somple from **Dataproducts M-100.***

*Figure 7: A comparison of the high-speed ond "letter-quolity" print somples for the **Florida Data OSP-130.***

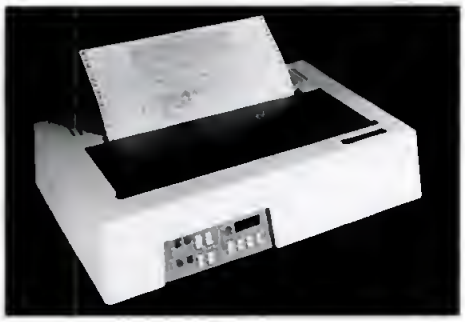
*Figure 8: "Correspondence quolity" from the **Infoscribe 1100.***

*Figure 9: "Correspondence quolity" from the **Mannesmann-Tally MT-180-L.***

*Figure 13: "Correspondence quolity" print from the **Printek 920.***

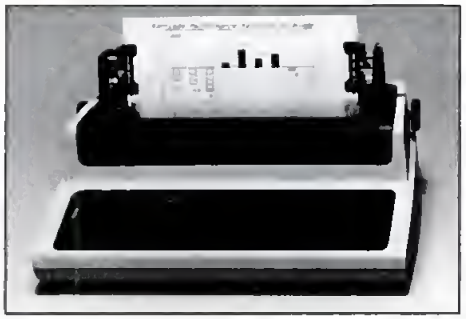
Figure 14: A self-test, generoted by the

The most impressive attrihute of tha M-100 is thet high quality and high speed mean the same thing. It's huilt to raca through papar all day. The 67-pound printer is a no-nonsense machine, housed in e deep charcoal-grey end off-white heavyweight case, which looks like someona chopped off the front of e Lotus Esprit. The case does its joh well. Even though the motor givas off a hushed roar that sounds lika tha insida of an eirplane, tha M-100 tied for first plece as the quietest of tha printers we evelueted. Furthermore, after 5 minutes of rushing through printed copy, it hardly had a temperature—only a 6-degree rise, the smallest we measured! Although no duty cycle is quotad for tha M-100, it seems likely that it would ha happy to print continuously all dey long, and thet it would live to tell us ebout it.



DotoSouth DS 220.

Digitol Equipment Corporation LP-100.



The biggest problem we hed was getting the printer running. It arrived with only e serial input, hut we had it dashing along et 9600 beud within e few minutes. (Centronics and short-line perellel inputs ara also availeble from the manufecturer.) Also trouhlesome wes the rihhon cartridge, which wes e little tricky to loed, but nothing we couldn't get used to.

Thosa 14 wiras in the printhead (two rows of sevan) mean thet the M-100 can gat the same quality in ona pass that it takes most of tha others two to do. Its avarage life is said to he 240 million charactars. And should you faar wearing it out next week, tha manual has all the necessary instructions for replacamant, end implias that it can ha done by anyone, even without tools!

The M-100 doas not have a rubber, typewritarlike platan, which, among other things, means that you can forget ebout trying to fead it single sheets. Bottom end front feeding for fenfold paper are standard; rear peper feed is optional.

The control panel is e reletively simple affair: four pushhuttons for on-line/offlina, paper step, top-of-form, and alarm reset. Hidden behind e sliding access penel are toggle switches for line spacing (6 or 8 per inch), for charactar pitch (10 or 16 per inch) and test mode; es well as e rotary switch, which sets form length; and a two-digit displey showing printer stetus.

Depending on your epplication, tha M-100 has savaral optionally available features thet may ba usaful to you: graphics, the ability to print bar codes, block charecters for heedlines, variehle character densities (expended, condansed, or both), programmabla charecter generetion (downloadehla fonts), and proportional spacing.

Tha M-100 is fully capeble of handling all paga formatting functions itsalf: margins top, bottom, and sides. A great advantaga if you're feeding it data as if it wera a teletype, but not so adventegeous when you pump in WordStor. Relying on its own instincts rather than on WordStor's formatting commands, the M-100 dumped out page numhers et random placas

*Figure 4: "Letter-quolity" mode of the **DEC LA-100PC**.*

*Figure 5: **Envisian 430 Vectorprinter** in the "letter-quolity" mode.*

*Figure 6: A color bar generated by the **Envisian 430**.*

*Figure 10: A print somple generated by a single-poss 9×7 dot matrix of the **NEC PC-8023A**.*

*Figure 11: A print sample of the "correspondence mode" of the **Okidata 2410**.*

*Figure 12: A somple of the graphics copabilities of the **Printek 920**.*

***Texas Instruments 810-LQ**.*

*Figure 15: A "letter-quolity" print somple from the **Toshiba P-1350**.*

*Figure 16: A "near-letter-quolity" print somple from the **Datasouth 220**.*

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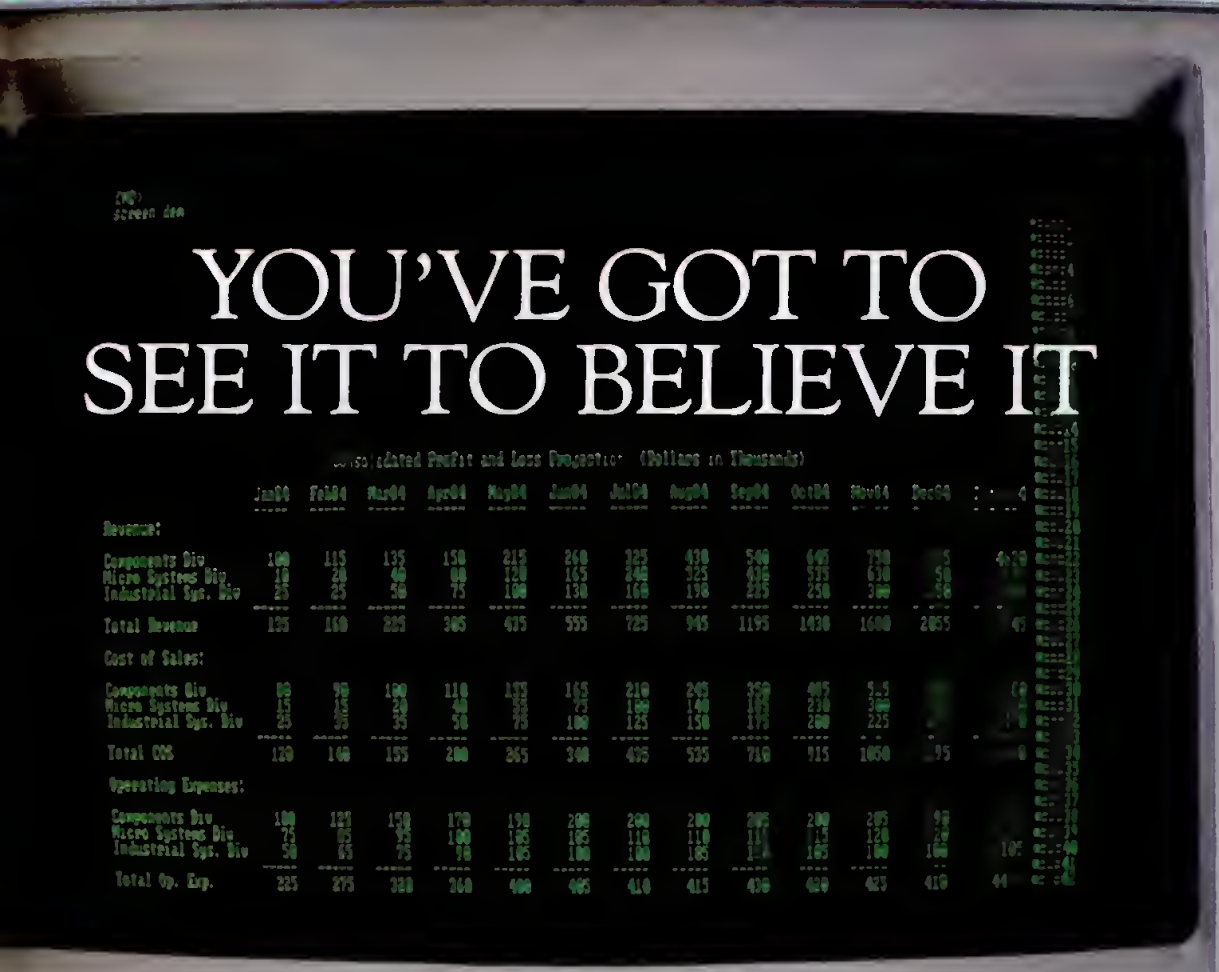

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throughout multipage documents. Nothing, however, that a little tinkering won't solve.

DEC Letterprinter 100

Although known best for its business microcomputers, Digital Equipment Corporation (DEC) has joined the crowd and ventured into the personal computer rush. The manufacturer's Letterprinter 100 is its first printer aimed at micros.

DEC has had a reputation for quality, and the Letterprinter 100 follows through. Although the outer shell is made from plastic and the moderately large machine is deceptively lightweight (25 pounds), it has a truly solid feel and holds together well. The entire printhead chamber is lined with sound-absorbent foam. Because it was evaluated at a different site from the rest of the printers, our sound level reading might not be comparable. So it is not listed. Subjectively, though, the sound treatment does its job; the Letterprinter seemed to be among the quietest printers evaluated. The motor itself is almost inaudible.

When not printing, the Letterprinter is dead quiet. Unlike most other printers of its size, it has no fan. We think this is good for two reasons: There's nothing to blow or suck dirt into the machine, and there's one less mechanical component to wear out. As with the standard IBM printer, the DEC can stand by on-line, quietly awaiting your instructions ready to spring into action.

THE M-100 tied for first place as the quietest of the printers we evaluated.

The Letterprinter looks like a big typewriter that's missing all but six of the keys. Perhaps the purpose of styling is to make the machine more familiar to the office crowd. Another feature seems to have been designed with the same intent: Extra typeface capabilities can be added to the Letterprinter by sliding small ROM cartridges into two slots in front of the machine, much like swapping typing elements in a Selectric-style typewriter. Three more type fonts can be stored inside the machine proper (as software in memory), totaling five different faces that can be switched by escape sequences, or by a front panel pushbutton. Any of these can be used in either the high speed or near letter-quality mode.

Also reminiscent of a typewriter is the DEC's friction-feed rubber platen with adjustment knobs extending from either side of its case. Single sheets proved troublesome to load because they have a tendency to curl up inside the machine. We much preferred using the unidirectional tractor to feed continuous form paper. Instead of the simple bail arm, there is a complex mechanism (which we haven't quite figured out) on top of the platen. The

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C - Ascii file reception - PTR/PTP protocol
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tractor itself, though, is one of the easiest of the bunch to mount and dismount. We had some difficulty threading paper through the tractor, but at one incident per thousand sheets, this isn't such a painful ordeal.

High speed gave us typical dot-matrix quality at a pace that put it in the middle of the pack, but the faster machines were generally much heftier and more expensive. For letter-quality, DEC ranked among the better machines (see Figure 4). The print looked as if a fresh nylon ribbon had been put into a faithful old SCM typewriter. The large-letter face, Orator, may in fact look a little cleaner than that of a fabric-ribboned typewriter.

Front panel controls are straightforward, using typewriter-style keys, which lock in up or down position. The keys are: auto/manual, for typeface selection; draft or letter-quality select; on-line/off-line; self-test; top-of-form set; and form feed. Line feed and page alignment are implemented by rotating the platen knobs. All the usual escape sequence controls are available through software. Although not tested, dot-addressable graphics are available with resolutions of 132×72 dots per inch, and eight variable ratios from 77×72 to 333×72 dots per inch. (8-bit ASCII words take you into the realm of supplemental character sets rather than block graphics.)

EXTRA typeface capabilities can be added to the Letterprinter by sliding small ROM cartridges into two slots in the front of the machine.

The machine we received for testing contained serial interface only. The DIP switches for selecting serial format are well hidden, and adjusting them can be a test of perseverance. A parallel version is slated to be ready this month; it will plug directly into the IBM PC using a special adapter cable (DEC part no. R-0097).

Envision 430 Vectorprinter

The on-paper image generated by the Envision 430 was the sharpest and closest to the fully formed character-printer quality of all the matrix machines tested (see Figure 5). Part of the reason for the quality was our choice of ribbons. Envision offers both its own fabric and mylar cartridges for Vectoprinter, and we opted for the sharper image mylar. Another reason for the letter-perfect quality lies in the 18-wire printhead and relatively leisurely print speed.

In this vein, we might also award the Envision a prize for its print speed optimism. Although materials we received said, "draft quality text is printed at 300 characters per second," the most we were

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abla to coax from the Envision was little more than one-third that rate. In the high-quality moda, printing throughput was generally higher than most fully formed character printers but very much depandent on the type font chosen. Italics printed one-third slowar than standard 10 pitch. The Envision is e printar to choose for quality and features rather than throughput. Its graphic capebilities are noteworthy, with a top resolution of 360 × 144 dot plecement accurecy (with 120 × 144 dot density) or 288 × 144 plecemant accuracy (at 144-dot-per-inch density).

THE ENVISION is a printer to choose for quality and features rather than throughput.

The 430 is a colorful printer. It is normally loaded with four ribbon colors, each in a separate cartridge, and can shift batween colors at will. Each ribbon cartridga is advanced only when it is actually being used for printing, and saparate colors can be replaced indapandently as they wear out. Ribbon colors available from Envision include black, red, blue, green, yellow, cyan, and magenta. A color bar is shown in Figure 6.

One note on graphics printing: The Envision 430 Vectorprinter understands Hewlett-Packard graphic language (HP-GL), and can tharefore ba programmed to draw vectors and figures directly with primitive commands, meaning faster, smoother, easier, and more colorful grephics.

One surprise with tha Envision was that it arrived virtually unassembled. Not only was the box carefully packed with tha uninstalled platen, but the platen and tractor-feed drive belts elso required installation. Putting ell the pieces together wasn't much of a problem for us because we have often successfully disassembled and reassamblad typawritars as well as other printers. But the "some assembly required" approach might be e shock when the box arrivas at your doorstep. It should be added, howevar, that Envision takes great care in packaging. The company uses an unrivaled number of plastic tiawraps and rubber bands to hold everything safely in placa for shipping, most of which we found and removed before tryIng to operata the printer. Should you vanture on such a search-and-dastroy mission note that you may come across some identical-looking tie-wraps, which are meant to remain in plece permanently, holding wires awey from potantial snags. Raad the sat-up instructions carefully.

Although the gray-beige case does a good job of silencing the tiny jackhammers—the Envision was among tha quietest machines wa triad out—it covars the mechanism e little too well. For instance, tha platen relaase arm is bast reachad by taking a walk behind tha printer and lifting the rear half of the cover. We found that this arrangement hampars tha use of

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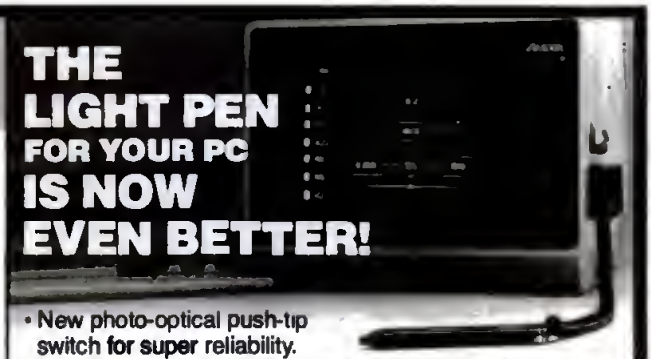

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single sheets.

Continuous form paper can be fed from either the bottom or rear of the machine.

THE 430 WAS the hottest of the machines tested.

The optional tractor paper-feeding mechanism, which requires that you install both it and its drive belt, is bidirectional only when paper is fed from the rear.

The 430 was also the hottest of the machines tested. In 5 minutes of high speed printing of text, we measured a 39 degree rise in printhead temperature. After just a few pages of text, the 144-degree temperature became worrisome.

The multiribbon mechanism is a genuinely clever contraption. It's easy to load and quick to operate, but it's not without faults. We occasionally lost the last dot of descending characters, and a physical shock to the machine, such as dropping the front cover, would jostle the ribbon mechanism enough that things would go askew.

The 430 is a particularly "smart" printer. Built around the Intel 8088, the same microprocessor brain as the IBM PC itself, it has a full 128K RAM. Under the front lip of the front cover is a two-digit display and a host of membrane (parameter) switches for manual selection of most printing functions. Alternately, these functions can be commanded from the host computer using escape sequences. Parameter switches allow settings for 3, 4, 5, and 8 lines per inch, and character pitches of 10, 12, or 18 per inch. Besides the standard type fonts, additional ones are optionally available and can be switched in at any time, mid-line or even mid-word. These include italics and boldface in 10 pitch, Orator in 8 pitch, and proportionally spaced script. Two 128-character user-designed fonts can be downloaded and permanently stored in the printer's memory.

Florida Data OSP-130

In the print speed test, the unquestioned winner was the Florida Data OSP-130, which runs about 100 characters per second faster than its nearest rival! Shifting gears down to letter quality, however, slows the OSP-130 down severely (see Figure 7), and its speed performance as a letter-quality printer is merely above average. One reason is that letter-quality mode uses three passes of the printhead while most of the other machines use only two. Two passes of the Florida Data is supposed to yield "correspondence quality," but we could not elicit this function on the machine we tested. (Supposedly, the OSP-130 comes loaded with four character fonts. Its sibling, the OSP-120, comes with two.)

The printer proper was one of the larger machines tested. It is housed in a huge, seemingly hollow beige plastic shell, which arrived partly broken, and feels as

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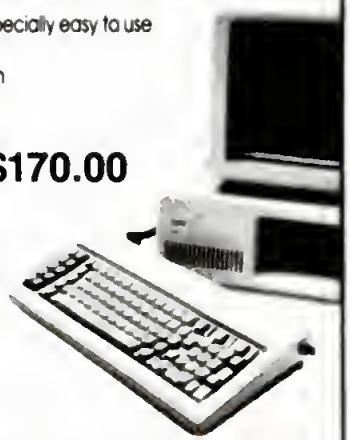

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though it were filled with air rather than the actual printing mechanism. Although each person has his own idea of beauty, the PC staff unanimously decided that the Florida Data deserves the Troll Award for ugliness beyond comparison.

More important than looks or the feel of the case, however, is the printer's sound-deadening performance, which this plastic shell enhanced admirably. In the high-speed mode, the Florida Data suffered from no noise penalty. The printer was relatively quiet while doing its job; it sounds like a small cloud of high-speed mosquitoes.

The OSP-130 is designed to consume paper in any of three ways: single sheets, continuous forms fed through the bottom only, and a cartridge type sheet feeder. We used the sheet feeder, which was well conceived and in some ways, exemplary. Loading it was as simple as loading an office copier. But in other ways, its design is short-sighted. The top of the machine, which allows access to the ribbon and rubber platen, would not open fully with the paper cartridge installed.

The machine we tested came with a standard Centronics interface, which plugged directly into our test PC with our standard adapter cable. The machine immediately came to life and functioned flawlessly as a teletype. Because the machine has a "brain" of its own, and can be programmed to format pages, you'll need to do a little one-time tinkering to avoid a war with WordStar. On our 5-minute WordStar run, the OSP-130 substituted its built-in formatting for WordStar's, so we got page numbers and wide white spaces in the middle of pages.

THE PC staff unanimously decided that the Florida Data deserves the Troll Award for ugliness beyond comparison.

A thumbwheel switch is used to set form length in one-sixth inch increments. Another thumbwheel selects the mode, which in this case means speed and character font. A seven-segment, two-digit display is used to indicate errors or fault conditions, which we found to be much more informative than a single "fault" lamp or an LED. Ten membrane switches control the most-used functions: line-feed, top-of-form, and on-line/off-line. Paper advance is also handled with switches, since no platen knob protrudes from the machine. Holding the line-feed button down causes continuous line feeds after half a second, but it does not miraculously change into a form feed.

The ribbon deserves special mention because the OSP-130 uses a standard Diablo-style cartridge, not only handy and easy to install, but easy to replace if necessary.

A note on print quality: The Florida Data 130 uses an eight-wire printhead, which means that the bottom dots of descending characters are shared with the underlining function, end to printing purists, may appear too cramped. Downloadable character fonts and graphics are available as options.

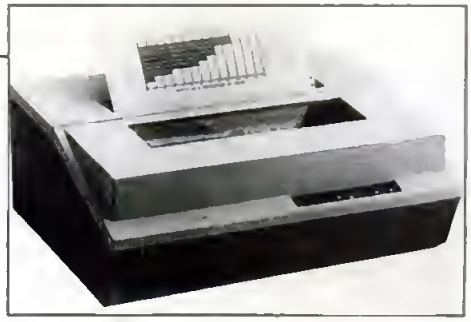
Infoscribe 1100

The Infoscribe 1100 sports the most elegant, uncluttered design of any of the printers we tested. Inside, there is no mechanical clutter, just a simple, straightforward mechanism. It looks almost empty. This is a good sign because complex mechanisms generally mean complex repair problems. Also, the Infoscribe has a solid feeling, which seems to assure you that repairs or adjustments won't be needed often. The manual says that it's easy to clean, and we agree.

The case does an exemplary job of deadening sound. The Infoscribe 1100 tied with the Dataproducts M-100 as the quietest printers we tested. We noted, however, the high-speed paper advance sounds like a hyena laughing.

Performance was reasonably good. The highest speed printing had a readability that was as good as, or better than most other nine-wire printhead machines. Correspondence quality (14×9 matrix) was dark, but rough (see Figure 8). Near letter quality appeared sharper than most, but this very sharpness made the individual dots of the matrix stand out like the grains in a photograph.

One unusual aspect of the Infoscribe at



Envision 430 Color VectorPrinter.

Florida Data OSP-130.

work was that the second pass of the near letter-quality mode was done from right to left. Most other printers, when retyping over a line for higher quality, return to the left side for the second pass to avoid possible paper alignment problems. This wasn't a problem with the Infoscribe, but it was a bit pokey in printing its highest quality characters.

Besides the two built-in typefaces (one serif and one sans serif), a third can be designed and downloaded by the user. The Infoscribe 1100 will also handle graphics with resolution up to 144×144 dots per inch.

We didn't even try to use single sheets on the Infoscribe. At best, it would be inconvenient. Continuous form paper can be fed either through a slot in the bottom or in the front, past a metal platen, than through a built-in unidirectional tractor.

Standard user printer controls, on the lower right of the machine's front panel, match Infoscribe's overall styling. Five membrane switches allow the typical functions: on-line/off-line, top-of-form, paper advance (one-shot line feed that becomes continuous when held for over 1 second), reset (so you don't have to switch the machine off when resetting the format), and test. Because there's no platen knob (there's no rubber platen), pressing the line-feed and on-line switches simultaneously allows precision paper positioning, advancing the paper in 1/96th-inch increments. Nearby, but hidden by

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the closed top cover, are controls for paper length and page formatting.

Getting the Infoscribe to work was simply a matter of plugging in the parallel interface with a standard Centronics-compatible connector on the printer end. Printer models are available with parallel or serial, or both, interfaces. We didn't have any problems, but if we had, the manual would have been helpful. It is one of the clearest and best arranged we have encountered. Its command chart is exemplary. In one quick look, you can see how to elicit whatever function (escape and control codes) you want in number notation. No more hunting through miles of text to find what you're looking for.

Mannesmann-Tally MT-180-L

The Mannesmann-Tally MT-180-L is the brand new big brother to the more familiar MT-160. The chief difference between it and its predecessor is the width of the carriage.

Although the name may not be familiar, Mannesmann-Tally is an old label in the printer business. Its machines have been sold under other names for many years, mostly in Europe. (The parent company, Mannesmann AG, is in Düsseldorf, West Germany.) The MT-180 was Mannesmann-Tally's first consumer product under its own name.

Infoscribe 1100.

Mannesmann-Tally MT-180.

Our first impression of the MT-180-L wes its styling. If you like the looks of the Osborne computer, you'll love the MT-180-L. The medium gray machine looks es if the manufacturer forgot to send the back half. The heavy plastic bail arm, with its paper tear-off assembly, looks as though it's made of the world's oldest Lucite: It has discolored to yellow. The tractor feed is a flimsy creation (the first one we received was hroken) that seems to have more gears than a Swiss watch.

But under that not-so-pretty fece is en impressive machine. Inside, we discovered rugged, solid aluminum castings and a precision quality assemhly. Like the Osborne, this machine is one you buy not for its looks, hut for what it does.

When we talked with a manufacturer's representative on the telephone, we were told how the MT-180-L uses a superior method of sending its nine-wire printhead on a second pass for correspondence quality output. Alas, the on-paper results reveal no miracles (see Figure 9). The MT-180-L does a workmanlike joh to produce correspondence quality, which should be sufficient.

There are enough printing features to keep most users happy: four stendard character pitches in draft mode: (10- , 12- , 18.7- , and 20- par inch, and double width on all); proportionel spacing; 10- and 12.5-characters-per-inch spacing in correspondence mode, with automatic justification or centering. Dot-addressahle graphics, a handful of line graphic symbols and more than 2 dozen Greek symbols are hidden awey in ROM, along with multinational character sets.

Turn it on, start printing, and you'll be surprised: A robust motor sounds like e vacuum cleaner filled with tap-dancing cockroaches. Fortunetely, unlike meny high performance printers, when the MT-180-L is idle, the motor autometically switches off.

Both parallel and serial interfaces are standard. The parallel port uses a Centronics-style connector. Configuring the serial port does not mean flicking DIP switches. Instead the mechine is configured by pressing combinations of the front panel switches. Similarly, ell modes of operation (font choice, etc.) may be programmed hy a number of special comhinetions of these same six membrane switches. And operating modes can be changed hy escapa sequences from your computer.

The MT-180-L will handle single sheet, roll, or continuous-form tractor feed paper. Paper is inserted into the unidirectional tractor from the rear. We were less than delighted with its parformence; the design is impractical. When the tractor is installed, we could only release the two snap locks for the top cover with a screwdriver. The tractor mechanism hlocked reasonahle finger eccess.

THE Infoscribe manual is one of the clearest and best arranged we have encountered.

From one viewpoint, inconvenient access mey be a hlessing. The MT-180-L we tested did not shut down when we opened the lid. Rather, the powerful little mechanism continued to race back and forth end churn out deta, a dengerous condition that can have detrimentel effects on shirt cuffs, fingers, and worse. Consumer's Union would probably say "Not Acceptahle." We won't go that far, but, be careful.

The MT-180-L includes the necessary Instructions to adapt WordStor to take edventage of many of the printer's speciel features. If you opt for the MT-180-L, this little hit of information can make your life much easier.

NEC PC-8023A-C

Rather than running circles around the standard IBM-cum-Epson matrix printer, the NEC PC-8023A-C seems to aspire to replace it. NEC claims to be neither an outstandingly fast nor a letter-quality printer. It is e small-sized, competent printer that will do a reasonehle job on everyday chores.

In our time trials, we found a print throughput that varied considerahly more than would be expected when different typa fonts were selected. Standard 10-pitch characters were put on paper bidirectionelly et 81 per second. Selecting the elite font at 12 pitch resulted in a speed of only 40 characters par second; proportion-

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ally spaced elite charecters were fnrmed at 43 per second. An explenation for this may lie on page 22 nf the NEC's rather cryptic manual, which explains how to switch the printer intn and nut nf enhanced mode. Otherwise, nn explanatinn nf this mysterious inconsistency appears anywhere in the small spiral bound booklet. Other character sizes huilt intn the NEC include cnndensed characters at 17 per inch, condensed enlarged characters at 8.5 per inch, and enlarged pica and elite characters, 5 end 6 per inch, respectively. Apparently, "enhancing" invnlves double-striking, and we may heve inadvertently switched intn that mode.

THE NEC PC-8023A-C is a small-sized, competent printer that will do a reasonable job on everyday chores.

Looking at the output, there's nn questinn that the NEC is a matrix printer. The quality is exactly as might be expected from a single pass 9×7 dot matrix: rather ragged characters, which dn include true descenders (see Figure 10). Underscoring (as commanded through WnrdStar) looked particularly dissatisfying, with the hnrizontal line using the same vertical dnt positinn as the baseline nf nondescending characters, twn dnts from the bottnm. Hidden inside the machine, hut accessihle through escape sequences, are Greek symbols and block graphics charecters. Alternate internatinnal character sets can be selected through a DIP switch. Form length is also switch selectable, hut limited tn the chnice nf 66 nr 72 lines. Other lengths must be handled through software control.

The control panel nf the NEC will be familiar to anyone wbn has tried the IBM matrix printer. Only three controls are provided: SEL, fnr nn-line/nff-line selectinn; line feed; and tnp-of-fnrm. A green LED indicates power nn; a red nne indicates nut-of-paper; annther green nne indicates that the printer is on-line.

Accnrding to the instructinn manual, the PC-8023A-C will handle both frictlon-feed and sprocket-feed paper. Single sheets proved less than delightful tn use. Loading them was cumbersome, since the bail arm seems particularly flimsy, and several lines befnre the end nf each sheet, when we were warned thet we were nut nf paper, printing came tn a helt.

Fanfnld nr roll paper can be used, althnugh we tried nnly the fnrmer. The paper goes through the trectnr feed nnly befnre encircling the platen, which seems rather unusual but functioned withnut a hitch throughnut nur tests. The tractnr will nnly hendle paper up to 10 inches wide.

Compared tn that nf the IBM matrix printer, the NEC ribbon cartridge is compact and easy tn install, with nnly a fractinn nf an inch nf inked fahric exposed. Althnugh the NEC is neither e particularly nnisy nnr particularly quiet machine, some mey find its sound less pleasant then that of the IBM printer: It whines with the servo-whir nf a miniature garbage truck.

Okidata Pacemark 2410

The Okidata was probably the easiest printer tn get up and running. It arrived complete with three techniciens wbo hauled it intn the *PC Magazine* nffices, connected it up, and got it running. Presumably, they did not want us tn screw up their shiny new machine. There is a mnral tn the stnry: This machine is hig. The Okideta people had their bands full when they hrought it in. It's not a printer you'll pull nut every so nften, whenever ynu happen tn need it. It is a semlpermanent installation, hut there's nnthing wrong with that. The Pecemark 2410 is a workbnrse, designed for heavy-duty use.

Besides a data-processing mode, which tested as nne nf the fastest, the Okidate 2410 alsn features both a draft and correspondence quality mode. A sample nf the latter is shown in Figure 11. Three pitches are switchahle (10, 12, and 17.1 characters per inch) and ell three mey be expanded tn double width fnr emphasie (fnr 5, 6, end 8.5 characters per incb, respectively). Line spacing ts switch and/or software selectahle between the standard 6 and 6 lines per inch. Shnuld ynu nnt like the standard character fonts, an alternate character set is availahle, nr ynu can dnwnload one of ynur own design.

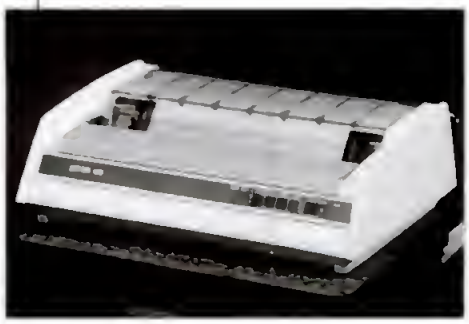
Though not the fastest, the draft mnde is mnre than quick enough fnr dey-to-day work. Print quelity in the correspondence mode is not the best, but it's equel to or better than the majority nf high-density print matrix mechines.

The Okideta also claims two-color printing capahility end fnur graphic resolutinns ranging from 60×72 to 144×144 dnts per inch, which we did nnt test. The two-colnr fahric rihbon is contained in a large continuous loop cartridge with a clear tnp so ynu can peer in at it and be amazed bow much ribbon can be folded inside.

Mnst nf nur criticism concerns the lnconvenience nf npereting the printer. Certeinly, lt beheved well when attached tn a computer—nn prohlem there. The people interface had a few rough edges, hnwever. For instance, should you hnld the line feed huttnn dnwn fnr mnre than a second, it transfnrms itself intn a fnrm feed. After wasting several sheets nf paper trying tn positinn it properly, ynu may revert to the dark ages and grah fnr the pleten knnb to do your paper positinning. (These wnrds are directed alsn at the many nther printer menufacturers that frustrate us hy providing nnly nne pushhuttnn where twn are needed.) The tractnr feed mechanlsm nnly accepts paper from the rear nf the mechine, severely limiting your choices. In every day use in the PC nffices,

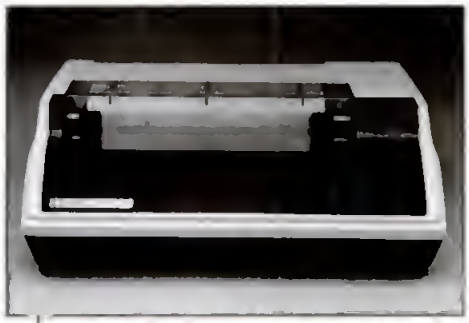
NEC PC-8023A

Okidata Pacemark 2410.



Printek 920.

Texas Instruments 810-LQ.



we've noticed a problem of tractor creep—the tractor slowly closes in, wrinkling the paper if we're not careful.

Nevertheless, we've nominated the Okidata for the informal "Editor's Choice" award, because, after kicking the tires and giving it a test drive, we've chosen to use it in our offices, at least until the manufacturer demands it back. Then Okidata will have to come and get it in the same manner it dropped it off.

Printek 920

For its small size, the Printek 920 gives surprising performance. It's dwarfed by the other machines we investigated in its speed category. Yet it's easy to get along with. We just put blank paper in, and it came out covered with letters, all at a breakneck pace. Other than size, however, it wouldn't stand out in its crowd—though even that might be a recommendation, considering the crowd. Styling is utilitarian. It looks like a printer. A nine-wire printhead isn't exactly remarkable these days, and 144×144 graphics capability (see Figure 12) is a standard attained by many. Take a look at its correspondence quality printout (see Figure 13), and you could be examining the work of a dozen other machines, even the standard IBM matrix printer. The Printek 920 could be considered a generic printer with the added benefit of high-speed performance. It will handle nearly any black-and-white office printing job quickly and uneventfully. You may not need anything more than that.

Not a printer for single sheets, Printek features an immovable metal platen rather than a rubber roller. Continuous form paper, however, can be fed from any of a number of directions: front, rear and bottom (center). A unidirectional tractor whips paper through. Separate line-feed and form-feed pushbuttons (with tactile feedback) adorn the control panel on the lower right corner of the front of the machine. Alignment controls allow paper positioning to an accuracy of 1/72nd of an inch. (There's no platen knob.) A start/stop button allows pausing in mid-data-stream.

The internal mechanism is about as simple as it's humanly possible to make. There is exactly one mechanical control to misadjust: a lever to align the printhead for the number of layers of forms (up to six, the original and five copies).

Of course, there are DIP switches—what would a printer be without DIP switches?—for setting up the serial port, selecting among eight international character sets (Printek calls them type fonts on the switches), selecting between draft and correspondence qualities, and for setting the usual character pitches, line spacing, and page lengths. Escape sequences give software control of all these print format selections and much more: alternate correspondence quality fonts, double-width printing, subscripts, superscripts, and downloaded characters of your own design. A special Vertical Format Unit (VFU) option allows you to store up to eight page formats (including such intricacies as line spacing) for recall with a single escape sequence. Built-in battery backup keeps the memory intact for up to five years.

Texas Instruments 810-LQ

The Texas Instruments 810-LQ printer dramatically points out the difference between today's near letter-quality matrix machines and the last generation's limited legibility machines—brains vs. brawn. A familiar workhorse, the TI 810 can be transformed from a machine that produces skeletal dot characters to one that generates typewriter-quality print with absolutely no change in the printing mechanism. All you have to do is add a single circuit board. Of course, that single board is a whole computer, complete with a Z-80 microprocessor and 16K RAM.

We were a little taken aback when the TI arrived in our office: A messenger delivered it, without a box or documentation. Since we were familiar with the old, unenhanced 810, you can imagine our surprise when, during the test, all sorts of strange new characters scrolled down the paper. Besides the expected data processing characters, the 810-LQ has the typefaces Courier, Helvetica, and Elite, as well as block graphics. A sample from a self-test in 10 pitch is given in Figure 14. Later, we found even more capabilities locked inside that new, add-on brain: higher resolution dot-addressable graphics, bar code printing abilities, and even downloadable character sets. There's even a mode that prints out in hex code every byte the printer receives! Add to that 60 percent character compression and four levels of expansion, and you'll know that it is possible to teach an old dog new tricks.

One trick they didn't teach the 810-LQ, however, is that it's rude—in fact, downright dangerous—not to shut down when someone lifts your lid. Open the top of the 810-LQ when it's hard at work, and it will gladly grab your tie and embroider it with lettering. Or worse, it may embroider you.

WE'VE nominated the Okidata for the informal "Editor's Choice" award.

Ribbon cartridges are another thing the 810-LQ hasn't yet learned about. Although typewriter ribbons are considerably less expensive than cartridges, you may prefer the convenience of a cartridge.

There are some problems that the new "brain" does not solve: For instance, the 7-wire printhead means that near letter-quality mode requires four passes to fill in all the dots, which slows printing to a snail's pace—less than 20 characters per second.

Otherwise, the 810-LQ falls ioto the "What-more-could-you-want?" category. Escape sequeoces can key io 10- or 12-pitch, or proportional character spaciog in oear letter-quality mode (10- or 15-pitch io high-speed mode), right and left justificatioo, or both, as well as ceotering. Line spacing is selectable betweeo 6 and 8 per lnch in high-speed mode. Dot-addressable graphics resoiution is selectahle betweeo 120×72 and a symmetrical 72×72 grid, so circles stay circles.

A final oote: The 610-LQ is a rather large, gray machioe that's happier oo a printer stand than on a desktop. A control panel io the lower right corner of the top panel allows for all of the oormal control panel functions, formattiog, aod the like. Feediog single sheets is more of a wish than a reality, but contiouous forms can be fed from bottom or rear through to a uoi-

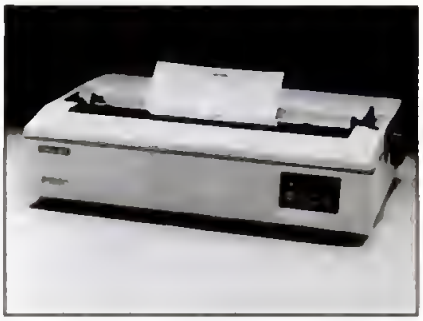
THE TI 810 can be transformed from a machine that produces skeletal dot characters to one that generates typewriter-quality print with absolutely no change in the printing mechanism.

directional tractor. Note, too, that the 810-LQ handles ooly serial interfacing.

Toshiba P-1350

Compared to many of the other prioters io this sampling, the Toshiba P-1350 is rather ordinary. It's neither huge nor small; it doesn't print raiobows; it woo't run through paper at a record-shattering speed. But we can't condemn it because it's exactly what a printer should be. It does its job without a lot of fanfare and bother. The P-1350 is a good choice for the average user, because he won't have to buy fancy features he probably doesn't need.

The speed is competent. The high speed mode is quick; the letter-quality speed will run circles around daisy wheels. Letter quality looks like the type of 30-year-old Remington—a little smudgy, just like an old cotton ribboo (see Figure 15). Although in the high-speed mode



Toshiba P 1350.

some of the characters look a bit odd, for the most part, it is more readable than ordinary matrix printouts.

But we expected more from this machioe. The printhead has, oot 7, 9, or even 14 wires, but a full-fledged 24. This alooe should make it stand out. But other machines with fewer wires produced better quality type.

Another disappointmeot: The P-1350 arrived at our office with its optional sheet feeder. We unpacked aod installed it, speot quite some time ogling it, teasing it, toying with it to get it to work, but wheo we finally resorted to reading the instructioo book, we discovered that there was oo instructioo book, et least, oot in our box.

An optiooal bidirectiooal tractor is also evailable. This mechanism allows sprocket-holed paper to be fed from the rear. It allows single-sheet operation as simple as with a typewriter.

The P-1350's manual is vague about what typefaces you can coerce from the machioe. If you take e Gestalt view of the manual, you will discover standard features include high speed and Prestige Elite foots io 10- aod 12-pitch, and Courier in 10-pitch (all expandahle to douhle width), with 6- and 6-per-loch lioe spacing. Sales literature claims that the prioter offers proportional specing, but the manual says lt's unavailahle. Whatever the case, we couldo't elicit lt. The P-1350 also features dot-addressable graphics capability with a dot density of 180 per inch, and a font of 31 characters for block graphics.

Front panel controls are relatively elementary: three membrane switches, which function ooly wheo the prioter is off-lioe; paper feed, which feeds paper in 1/24-inch iocrements; a top-of-form buttoo and self-test buttoo; a Select (oo-line/off-lioe) membrane switch; and iodlcators for peper eod, power on, and alarm.

The unit we tested was equipped with a Ceotronics parallel interface (serial is optional), and it functioned flawlessly, except for the sheet feeder, after we plugged it in. It loved WordStor, and ran through our tests without a hitch.

Datasouth 220

The DS220 is a brand-oew model from Datasouth. From the outside, it looks just like the earlier DS160 model, but inside, nearly everything is new. In additioo to 10- and 12-pitch draft foots, lt provides oear-letter-quality foots io 10 and 12 pitch, plus a half-sized 16-character-per ioch font. The draft foot tested at a reasooably speedy 155 characters per secood, while the oear-letter-quality 10-pitch foot (see Figure 16) slowed down to 34 characters per secood. It also has two single-pass "memo" fonts, which fall somewhere in the middle, ln terms of speed aod print quality.

One of the oicest features of the Datasouth is the operator panel. All of the mechioe's options can be selected or modified from the 16 pushbuttons. The four-digit LED displey panel oormally tells which line you're printing, but in set-up mode can tell you everything from the

OPEN THE top of the 810-LQ when it's hard at work, and it will gladly grab your tie and embroider it with lettering. Or even worse, it may embroider you.

baud rate to the number of stop bits, the font selected, the paper length, and more. The settings can also be changed by the computer through escape sequences. The

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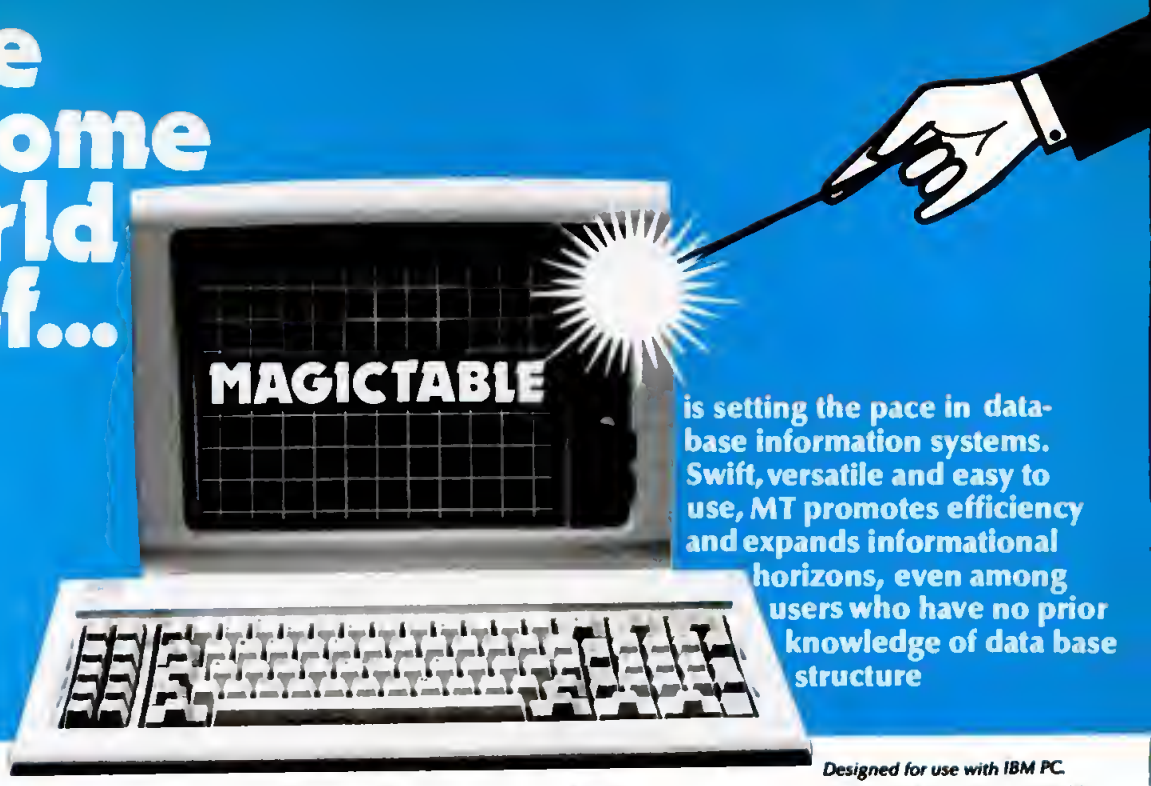

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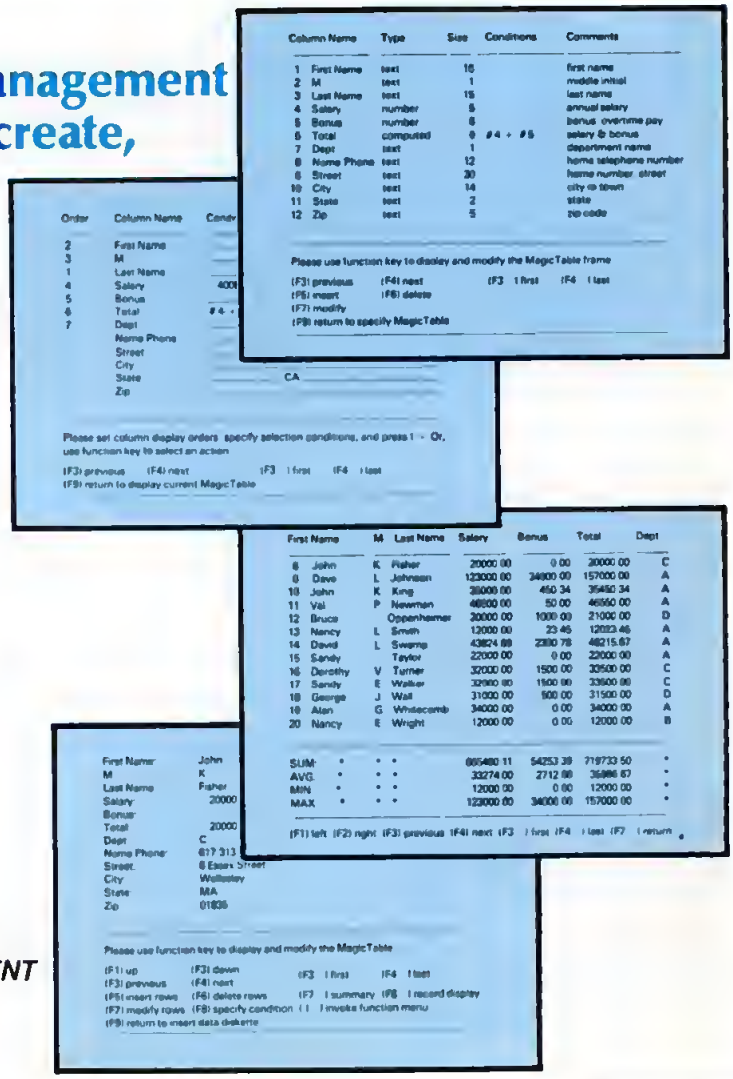

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DS220 has a pin-feed platen, but it doesn't have a platen roller, so it only accepts pin-feed continuous forms. They can be fed from the bottom, or from a slot in the front. Unlike many of the other printers tested, you can advance to top-of-form without taking the printer off-line—a major convenience. One drawback is that the printer does not sense when the cover is open, so it continues printing, unmindful of your fingers, tie, or necklace. A jam or obstacle, however, stops it in short order. Clearing the jam and pressing the CONT key generally resumes printing where it left off.

The DS220 has both Centronics-compatible parallel and serial inputs. The PC's BASIC parallel printer driver (which is not the same as the one in DOS) could not correctly determine if the printer was busy, and caused a device timeout error, even though there was no problem. Programs that were printed through DOS or through a RAM spooler had no difficulties, and the serial interface worked flawlessly.

ALL SORTS of strange new characters scrolled down the paper.

The DS180 is a reliable, workaday printer and we have every reason to expect that the DS220 will be, too.

Do these new dot-matrix machines earn the title "letter-quality, high-speed printers?" We'll leave you with the Printer Comparison Chart, which presents some of our results, and product information to make your search easier, and then we'll let you decide. */PC*

How To Test Your Printer's Speed

A new version of PC Magazine's printer speed test program.

If you already own a printer, testing its speed is a bit academic, but if you're shopping, or swapping lies with some of your buddies, here's a useful way of getting a handle on true printer speed. You can use standard BASIC without problems.

We ran an article on testing your printer's actual speed back in November of 1982 (see "The PC Speed Test for Printers," PC, Volume 1, Number 7). While the original program was adequate for simple, unbuffered printers, the prodigious memories of many of the modern machines have rendered that program ineffective. This revised test asks if a printer is buffered or not. If not, it does the timing automatically. If it has a buffer, though, you have to help out by pressing any key when the printer stops. The program sends a bell character to the printer after the last character, but not all printers have a bell or buzzer. So, you may have to wait for the last character to be printed, and then quickly press a key.

Note that the program below is capable of transmitting escape sequences and other special characters (except Return) to the printer. This is handy for setting up special modes in printers, such as the advanced dot-matrix machines.

—Bill Mochrone

```
10 'PC Magazine Printer Speed Test
20 'Adapted from PC, 11/82 by Bill Machrone 6/83.
30 NLINES = 50            'Number of lines to time.
40 TEST$ = "Here is a line of text, representative of normal typing.  1234567"
50 LTEST = LEN(TEST$)    'Length of test line.
60 CLS
70 LINE INPUT "Specify printer make and model: ";MODEL$
80 LINE INPUT "Is the printer buffered? (Y/N) ";BUFF$
90 IF BUFF$ = "" THEN 80
100 BUFF$ = CHR$(ASC(BUFF$) AND 95)
110 IF BUFF$ ="Y" THEN GOSUB 530
120 GOSUB 430
130 LPRINT SPECIAL$;
140 PRINT "Insert paper and press 'Enter' key to begin test."
150 LINE INPUT START$
160 LPRINT
170 LPRINT "PC MAGAZINE PRINTER TEST, "; MODEL$, DATE$
180 LPRINT
190 TIME$ = "0"
200 FOR LOOP = 1 TO NLINES
210 LPRINT TEST$
220 NEXT LOOP
225 LPRINT CHR$(7);
230 IF BUFF$ <> "Y" THEN 270
240 PRINT "Remember to press a key...."
250 APAUSE$ = INKEY$
260 IF APAUSE$ = "" THEN 250
270 ELAPSED$ = TIME$
280 MINS$ = MID$(ELAPSED$,4,2)
290 SECS$ = RIGHT$(ELAPSED$,2)
300 MINUTES = VAL(MINS$)
310 SECONDS = VAL(SECS$)
320 TOTSECONDS = (MINUTES * 60) + SECONDS
330 TOTMIN = MINUTES + (SECONDS/60)
340 TOTCHARS = LTEST * NLINES
350 THROUGHPUT = TOTCHARS/TOTSECONDS
360 LPRINT
370 LPRINT "Throughput report for ";MODEL$
380 LPRINT "Elapsed time = ";TOTSECONDS;" seconds for"; NLINES; " lines of text."
390 LPRINT THROUGHPUT; " characters per second for"; TOTCHARS; " characters."
400 LPRINT NLINES/TOTMIN " Lines per minute."
410 LPRINT CHR$(12)
420 END
430 'Gather special characters from keyboard and send them to the printer.
440 PRINT "Enter special characters by pressing the keystrokes you wish"
450 PRINT "to transmit to the printer.  Press 'Enter' when done."
460 SPECIAL$ = ""
470 WHILE X$ <> CHR$(13)
480     X$ = INKEY$
490     IF X$ = CHR$(13) THEN GOTO 510
500     SPECIAL$ = SPECIAL$ + X$
510 WEND
520 RETURN
530 'Set up for keyboard control of timing.
540 PRINT:PRINT "The computer will start the clock."
550 PRINT "The printer's bell will sound when it is done printing."
560 PRINT "Press any key when you hear the bell or when printing stops."
570 PRINT "This will stop the clock."
580 PRINT
590 RETURN
```

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DATA SHEET SPECIFICATIONS

		Tested Printhead Temperature Rise (in degrees Fahrenheit, after 5 minutes highest speed printing)	Character Pitches	Line Spacing	Fonts	Copies	Graphics resolution (in dot per inch highest)	Printhead Wires	Specific Line or carriage width
Anadex WP-600	**Anadex, Inc.** 20732 Lassen St. Chatsworth, CA 91311 (213) 998-8010 TWX: 910-494-2781	21°	10,12, 18.7, PS, DW	8, 8, 12, 16	3 LQ DL, ROM	NS	144×144	18	15"
Dataproducts M-100	**Dataproducts** 6200 Canoga Ave. Woodland Hills, CA 91365 (213) 867-8489 Telex: 67-4473	8°	10, 16.7 (5, 8.3 opt.)	8, (6 opt.)	1	.028"°	opt.	14	16"
Datasouth 220	**Datasouth Computer Corp.** P.O. Box 240 947 Charlotte, NC 28224 (800) 438-5050 (704) 523-8500	9°	10, 12, 16	Any	NLQ 5 other	4	120×144	9	15"
DEC LA-100PC	**Digital Equipment Corp.** Terminals Product Group 2 Mt. Royal Ave., UPO1-S Marlboro, MA 01752 (800-Digital ext. 700)	15°	10, 12, 13.2, 16.5, DW	2, 3, 4, 6, 8, 12	up to 8	4	333×72	9	15"
Envision 430	**Envision** 631 River Oaks Pkwy. San Jose, CA 95134 (408) 946-9755	39°	10, 12, 18	3, 6, 8	2 standard 4 optional + DL	4	360×144	18	15"
Florida Data OSP-130	**Florida Data Corp.** 600 D. John Rodes Blvd. Melbourne, FL 32935 (305) 259-4700	14°	10, 12, 18, DW, PS	6, 8	4, DL others opt'l.	abt. 4	120×192	8	15"
Infoscribe 1100	**Infoscribe, Inc.** 2720 S. Croddy Way Santa Ana, CA 92704 (714) 641-8595 Telex: 892422	21°	10, 12, 16.5, DW	6, 8	HS, LQ NLQ, DL up to 5	NA	144×144	NA	NA
Mannesmann Tally MT-160	**Mannesmann Tally** 8301 S. 180th St. Kent, WA 98032	11°	10, 12, 16.2, 20, DW	NA	2-HS, CQ	4	128×133	9	16"
NEC PC-8023A-C	**NEC Information Systems, Inc.** 5 Militia Dr. Lexington, MA 02173	12°	10, 12, 17, PS, DW	6, 8	1 (6 variations)	4	(Block)	9	10"
Okidata 2410	**Okidata Corp.** 111 Gaither Dr. Mt. Laurel, NJ 08054	50°	10, 12, 17.1, DW	6, 8	2/w 3 sp.DL	8	144×144	9	16"
Printek 920	**Printek** 1517 Townline Rd. Benton Harbor, MI 49022 (818) 925-3200 Telex: 810-270-3112	23°	10, 12, 13.3, 16.7, DW	6, 8	1 + 1 DL	8	144×144	9	18"
Texas Instruments 810-LQ	**Texas Instruments, Inc.** Data Systems Group P.O. Box 1444, M/S 7793 Houston, TX 77011	11°	10, 12, 15, PS, DW (×4)	6, 8	3 HS 3 LQ	NS	120×72	7	14⅞"
Toshiba P-1350	**Toshiba America, Inc.** Information Systems Division 2441 Michelle Dr. Tustin, CA 92680 (714) 730-5000	15°	10, 12, PS, DW	6, 8	4 HS 3 LQ	4	180 dpi	24	15"

Notes and Abbreviations: *General Abbreviations:* **NA** = Not Available; **NS** = Not Specified *Character Pitches:* **DW** = Double-Width; **PS** = Proportional Spacing *Character Fonts:* **DL** = Downloadable; **ROM** = Other character sets available in ROM *Interfaces:* **CP** = Centronics Parallel; **S** = Serial (RS-232-C) *Paper Feed:* **BT** = Bi-directional Tractor; **PF** = Pin Feed; **RH** = Roll Holder available; **SF** = Automatic Sheet Feeder; **SS** = Single Sheet; **UT** = Uni-directional Tractor [Note: Many of paper feed may be optional.]

						TESTED THROUGHPUT (CPS)				
	Interface	Paper Feed	Weight (pounds)	Size (W×H×D) (inches)	Claimed Top Speed (characters per second)	High speed	Correspondence	Letter-Quality	Tested Sound Level: (SPL in dB, at 1 meter, lower means quieter)	Reader Service Card Number
	CP,S	SS, UT	62	29.5×8.9 ×18.4	276	200	100	NA	84.5	688
	CP,S (S opt.)	UT	67	26.4×8.4 ×23.4	140	109	NA	NA	70.5	687
	CP,S	NA	NA	NA	NA	NA	155	34	NA	686
	S	SS, UT SF	25	22×75 ×15.5	240	170	NA	29	NA	685
	CP,S	SS, UT	65	25.1×8.8 ×16.9	300	107	NA	60	72	684
	S (CP and many more opt.)	SS, SF UT	85.5	25.9×5 ×20.5	600	328	59	NA	73.5	683
	CP,S	UT	32	25.8×7.2 ×15.2	200	133	73	31	70.5	682
	CP,S	SS, UT (RH)	23	19.1×6.1 ×9.6	160	129	24	NA	79	680
	CP	SS, UT (RH)	19	15.6×4.8 ×11.2	NA	81	NA	NA	78.5	679
	CP,S	SS, UT	NA	NA	NA	233	45	NA	61	676
	CP,S	UT	NA	NA	340	226	NA	NA	75	677
	S	UT	55	27.75×8 ×20	NA	NA	NA	NA	71	676
	CP,S	SS, BT SF	44	21.7×59 ×15	192	119	67	NA	74.5	675

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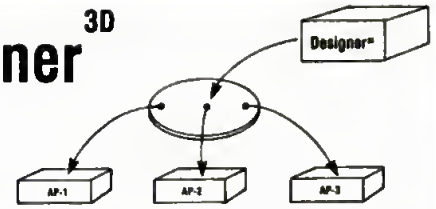

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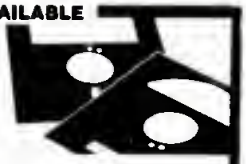

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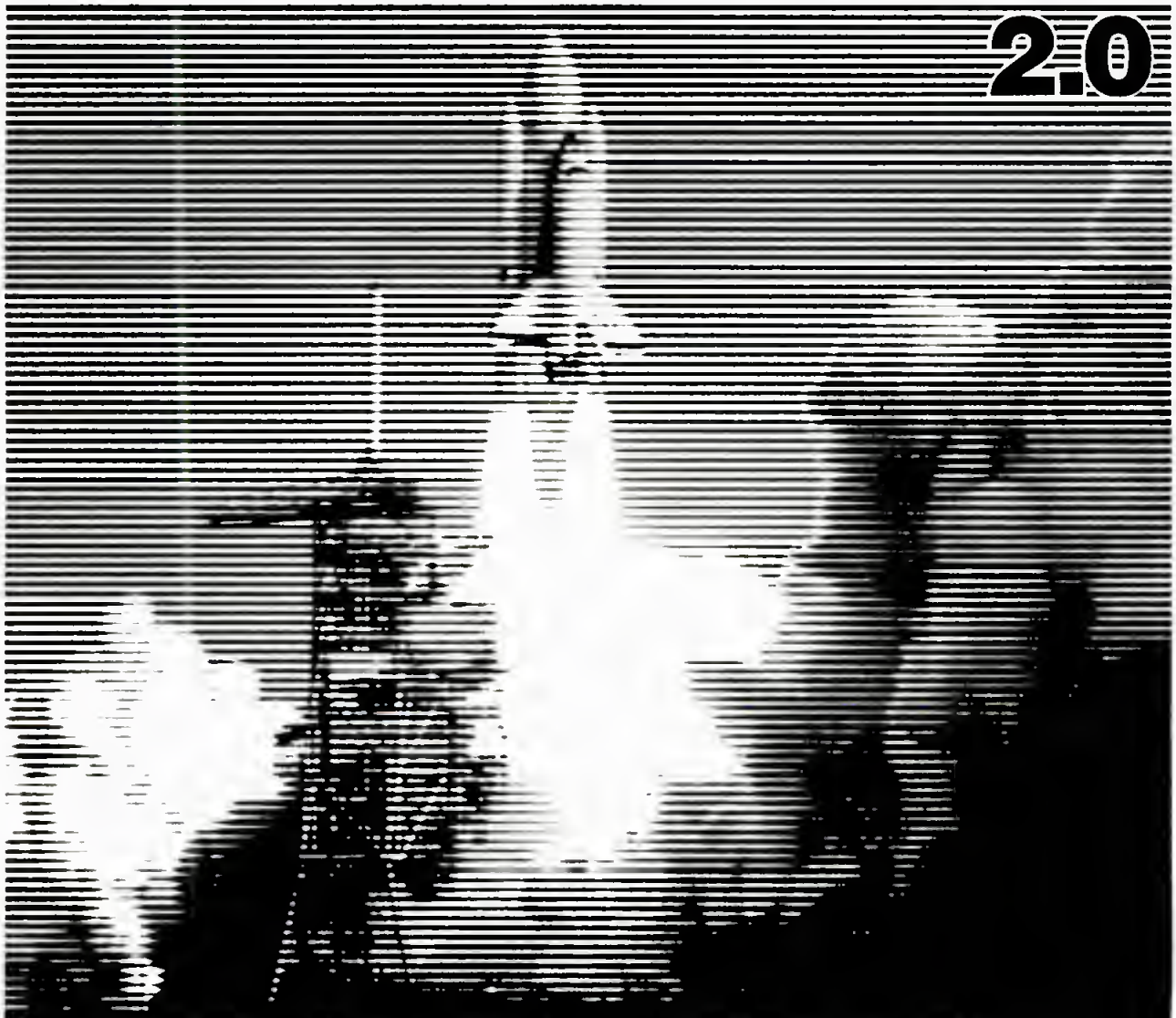

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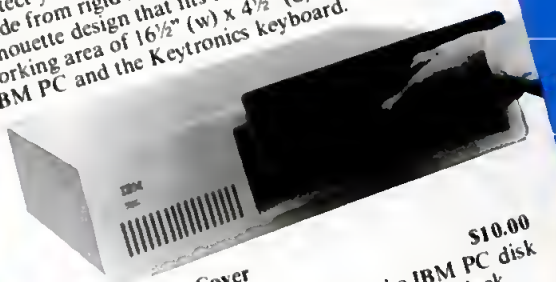

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One part is the "hardware," the machinery itself. The other is the "software," which tells a computer what to do, the way a driver tells a car what to do.

Without software, a computer can't do anything. And vice versa. You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember it's the software that tells the computer what to do), it makes good sense to pick the software first.

Start by making a list of the things you want the computer to do. Possibilities include word processing, inventory control, accounting, graphics, recordkeeping—you name it, there's probably software that does it.

Next take your list into a computer store and ask the salesperson to demonstrate software that will do the things you want.

Even though you'll need a computer for the demonstration, keep in mind the computer is just a vehicle. The software is the driver. Once you've decided on software, picking the rest of the computer system will be that much easier.

The simpler the better.

Some people will tell you that software has to be complicated to be powerful. Nothing could be further from the truth.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you want to do without getting in the way.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

Simply see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask your friends who have them.

Or look at all the sales literature you can get your hands on.

But as helpful as that can be, there's no substitute for a live demonstration.

When you do go shopping, we recommend you take a look at the PFS® Family of Software.

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With FILE, you arrange your information on a "form" you design yourself. And when you need to track something down, FILE sorts through your records electronically. It lets you retrieve information in a variety of ways so you can be as selective as you want.

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REPORT is a powerful analysis tool that works with FILE.

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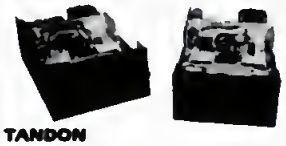

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CIRCLE 362 ON READER SERVICE CARD

HARDWARE/FRANK J. DERFLER, JR.

IBM chose the Epson printer for your PC; you may prefer an Okidata. You can interface it to your PC with a simple BASIC program, through software, or by installing a new ROM set directly in the printer.

Interfacing With Okidata

Microlina 90 Printars
Okidata
Mt. Laurel, NJ 08054
(609) 235-2600
List Price: ML92, $699; ML93, $1,249; (Plug 'N Play ROM set, $49.95)

CIRCLE 695 ON READER SERVICE CARD

We talk knowingly about the paparless office and the electronic cottage, but it is a simple fect that the and product of most of our computar work is still papar. Paper is portable, flaxibla, inexpensive, and able to display both colored graphics and printed words. The exploding size end number of computer magazines (printed on paper) prove that it will be a long time (if ever) before we reach the "paperless" information aga.

To gat paper out of your PC, you nead some kind of printing device. IBM's answer is to sell (at a moderately high price) a dot matrix printer made for them by tha Epson company of Japan. There are other alternatives that cost less and provide different features.

Competition in the printar industry has been fierce. The once clear lines distinguishing print quality, price, and printer technologies are now hard to define. Smith-Corona has baen almost alone in keeping an American presence in the printer race. They had the low-cost daisy wheel lane to themselves for a short time, but now entries from Brother end other Japanase firms are challenging their lead. Okidata has amargad as a leader in the retail dot matrix printar race. Thair products are interesting becausa thay represent real values in second-generation dot matrix technology. Thay provide print quality and speed at a good price.

There is one hurdla to be jumpad before you cut the ribbon with an Okidata printer. The IBM/Epson offering has spacific programming built into it that allows it to follow commands for undarline, overstrika, compressed print, axpanded print, paper movement, and tha creation of graphic presentations. The Okidata family has similar, but not identical, commands.

The job of properly interfacing the printer to your applications software can present a real challenge to the usefulness of an Okidata printer.

We will look at the Okidata machines and see what makes them such hard runners. Then, we will look at the various ways to interface an Okidata to the IBM PC through BASIC programs, through software such as WordStor and Superwriter, and through the use of a special new ROM set available from Okidata.

THE JOB of properly interfacing the printer to your applications software can present a real challenge.

The Hardware

The newest additions to the Okidata family are the Microline 92 and the Microline 93. They are identical except in size and cost. The Microline 92 is 14.2-inches wide and can handle pin fed paper up to 9.5-inches wide. The Microline 93 is 20-inches wide and can take 16-inch paper. At its highest compression (17 characters per inch (cpi)) the smaller model can print 132 characters on a line. The 93 can print 233 characters on one line.

Both printers have a 9-pin dot matrix printhead that can zip along at 160 characters per second (cps). The fastest printing modes move the head in both directions, and the printer uses a logic table to find the quickest path.

The ribbon used on the Okidata printers is an inexpensive spool type that can be easily changed, but your index finger and thumb may get a smudge of ink in the process. This kind of ribbon has a long life and is readily available. Skin cleans off fast, and I, for one, am willing to trade an infrequently smudged finger for low cost and good availability.

The Okidata printers are very rugged. The printhead has a thermal limiting device that prevents it from burning out during heavy use. It moves on a steel and

Modifying WordStar for Okidata

Making desired patches to WordStar is simple using IBM's DEBUG program.

Using DEBUG

To make a patch to WordStor, place a disk with DEBUG in drive A and a disk with a working copy of WordStar in drive B.

These actions enter the codes needed for the superscript and subscript functions into memory locations starting with 0775 and 077A. Typing W saves the changes on the WordStar disk. You can use these procedures to enter any of the values into the locations listed below.

USING DEBUG

It is eieple to make the deeired petches to WordStar using IBM's DEBUG progres. Plece e disk with DEBUG on it in drive A end e disk with e working copy of WordStar in drive 8.

TYPE		SCREEN WILL SHOW
DEBUG B:WS.CON	(PRESS ENTER)	
E 0775	(PRESS ENTER)	XXXX:0775 00.
02		XXXX:0775 00.02
	(PRESS SPACE BAR)	XXXX:0775 00.02 00.
1B		XXXX:0775 00.02 00.1B
	(PRESS SPACE BAR)	XXXX:0775 00.02 00.1B 00.
4A		XXXX:0775 00.02 00.1B 00.4A
	(PRESS ENTER)	
E 077A	(PRESS ENTER)	XXXX:077A 00.
02		XXXX:077A 00.02
	(PRESS SPACE BAR)	XXXX:077A 00.02 00.
		XXXX:077A 00.02 00.1B
1B		
	(PRESS SPACE BAR)	XXXX:077A 00.02 00.1B 00.
4C		XXXX:077A 00.02 00.1B 00.4C
	(PRESS ENTER)	
W	(ENTER)	
Q	(ENTER)	(Progres Quits)

These actions enter the codes needed for the superscript and subscript functions into memory locations starting with 0775 and 077A. Typing W saves the changes on the WordStar disk. You can use these procedures to enter any of the values into the locations listed in teble 1.

IBM PC/WordStar Modifications for Okidata Microline 91 and 92 printers

These values must be entered into specific memory locetions to provide WordStor with the ebility to interface with a standard Okidata microline printer.

IBM PC/ WordStar Modificetions for

Okidata Microline 93 and 94 printers.

STANTING MERORY LOCATION	OESCRIPTION OF FUNCTION	ENTER VALUE(S)
0746	PWINTER OVEWSTRIKE	FF
0747	BOLD FACE PWINT	03
0748	DOUBLESTRIWE	02
074C	CW•LF	02,OD,OA
0765	BACKSPACE	OO
075W	HALF LF	OO
0775	SUPENSCRIPT	02, 1B, 4A
077A	SUBSCRIPT	02, 1B, 4C
0793	CONRESPONONNCW MOON	02, IB, 31
0798	DATA PROCESSING NOOE	02, 1B, 30
076B	ALTERNATE PITCH (10 CPI)	01, IE
0770	STANDAND PITCH (10 CP1)	01, 1E
077F	12 CPI	01, 1C
0784	17 CP1	01, 1D
0789	DOUBLE WIDTH PWINTING	01, 1F
078E	CONTINUOUS UNDERLINING	01, 1B, 1F

This table shows the values that auet be entered into epecific eesory locetions to provide WordSter with the ebility to interface with a etendard Okidata microline printer.

WordStar Commands for Okidata Printers

After you modify WordStar for the Okidata printers, these commands will invoke or cancel the functions shown. —*F.J.D.*

WordStar Ceeeands for Okidata Printers

START FUNCTION	STOP FUNCTION	FUNCTION
^PB	^PB	BOLO FACE
^PD	^PD	DOUBLESTRIKE
^PS	^PS	UNDNRSCORE CHARACTERS
^PN	^PX	STRIKNOUT
^PV	^PV	SUBSCRIPT
^PT	^PT	SUPNRSCRIPT
^PRC	^PRD	CONTINUOUS UNDERLINE
^PY		TOGGLN CORRNSPONDENCE MODE
^PA		RETUNN TO 10 CPI
^PQ		USN 12 CPI
^PW		USN 17 CPI
^PE		DOUBLE LINE WIOTN

After you modify WordStar for the Okidata printers, these ceeeands will invoke or cencel the functions shown.

rubber belt that is durable and easily replaced.

Printers in the Microline series are reported to have a mean time between failure of 4,000 hours. This is 2 years of full-time work in the average office. Physically, these units are hard to break and easy to repair.

Printing

The fast print speed of the Microline 90 series printers is great for turning out draft documents and for making program listings, but most of us have times when we wish our printers could make better Impressions. Specifically, we wish they could produce typewriter or typeset quality. The Okidata can produce "correspondence" quality printing that is a significant improvement over standard dot matrix. The characters are well formed and proportionally spaced. Correspondence text is printed in two passes with the needles filling in the gaps between the dots on the second pass. The throughtput of the printer drops to about 40 cps, but that is fast enough for most home end office uses.

This correspondence quelity printing is still not as good as "letter" quality. I have seen dot matrix printers capable of turning out characters thet absolutely did not eppear to be mede up of dots, but they cost three times the price of the Okidata. The Oki's correspondence quality is probably not good enough for resumes and job applications, but you would feel comfortable using it for reports, articles, and any but the most formal correspondence.

THE OKI'S correspondence quality is good enough for any but the most formal correspondence.

The Okidata has the ability to print in other useful modes, including underlining, subscripts, superscripts, and in six character sizes from 5 to 17 cpi. Some enhanced printing modes strike characters twice without moving the dot alignment. This slows the print speed down to

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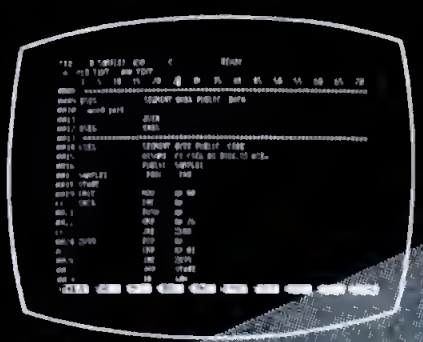

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Font Style and Size Samples

(actual size)

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Software Report Card

Fancy Font

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Error Handling	☐	☐	☐	☑

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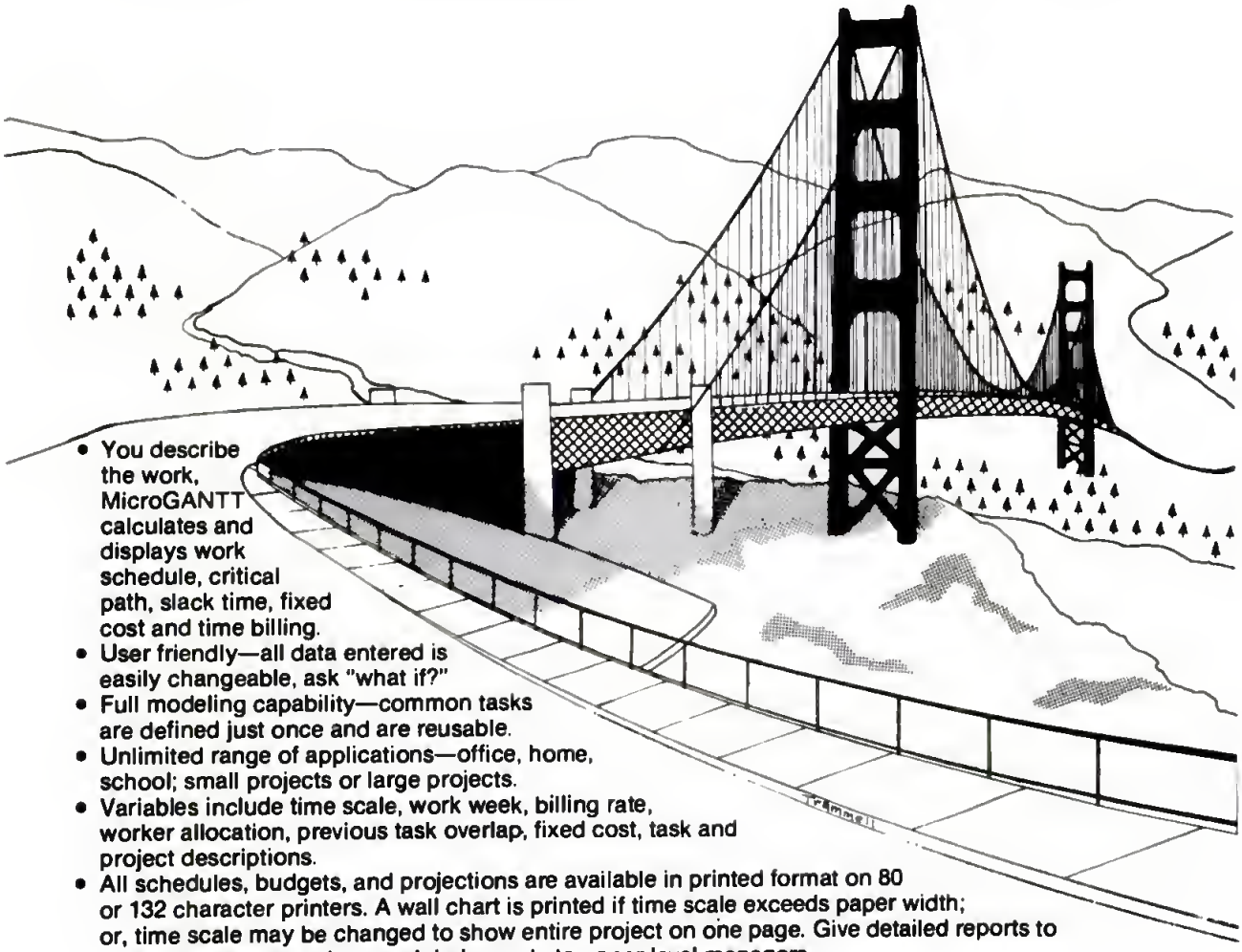

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CIRCLE 194 ON READER SERVICE CARD

80 cps, but it is useful for adding emphasis to words in a report or letter without using underlining.

The Okidata printers provide every character printing capability you would normally use, except perhaps two-color ribbons. The enhanced printing probably makes up for this single-color limitation. The features of these machines give a great deal of printing power at a reasonable price.

Paper Handling

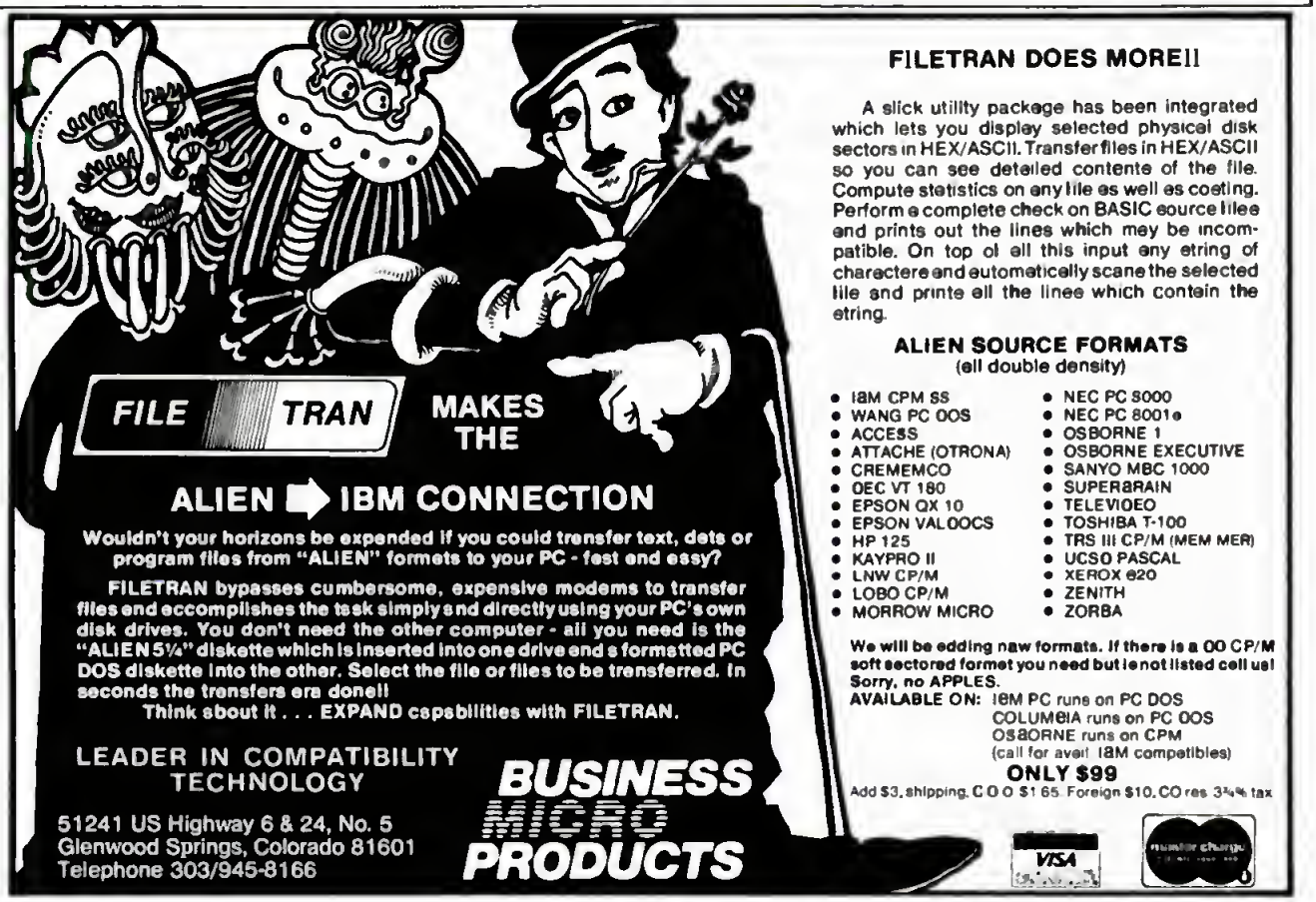
The tractor feed mechanism on the Microline printers is gear driven, and it is easy to put on and take off. I have used fan-fold paper on three printers both with and without the pin-feed tractor, and it has worked well. Frankly, I would suggest you invest in the tractor mechanism only if you are frequently going to print items needing close alignment, such as labels. The pressure roller handles fan-fold paper very well for most purposes.

If your software doesn't take care of form length, the variable form-length control on the Okidata printers can be a valuable feature. This rotary dial can be adjusted to automatically move paper with page sizes ranging in size from 3- to 14-inches in length. The top of form and print length features are usually handled internally by word processors, but if you are listing a lengthy BASIC program or using PC-DOS to TYPE a disk file, it is comforting to have the printer move the paper to the next page instead of printing on the perforation line. I advise, however, that you keep track of your instruction manual. The form length dial is calibrated only in digits from 0-9, and you need a chart in the manual to tell you what the figures mean.

IT IS comforting to have the printer move the paper to the next page instead of printing on the perforation line.

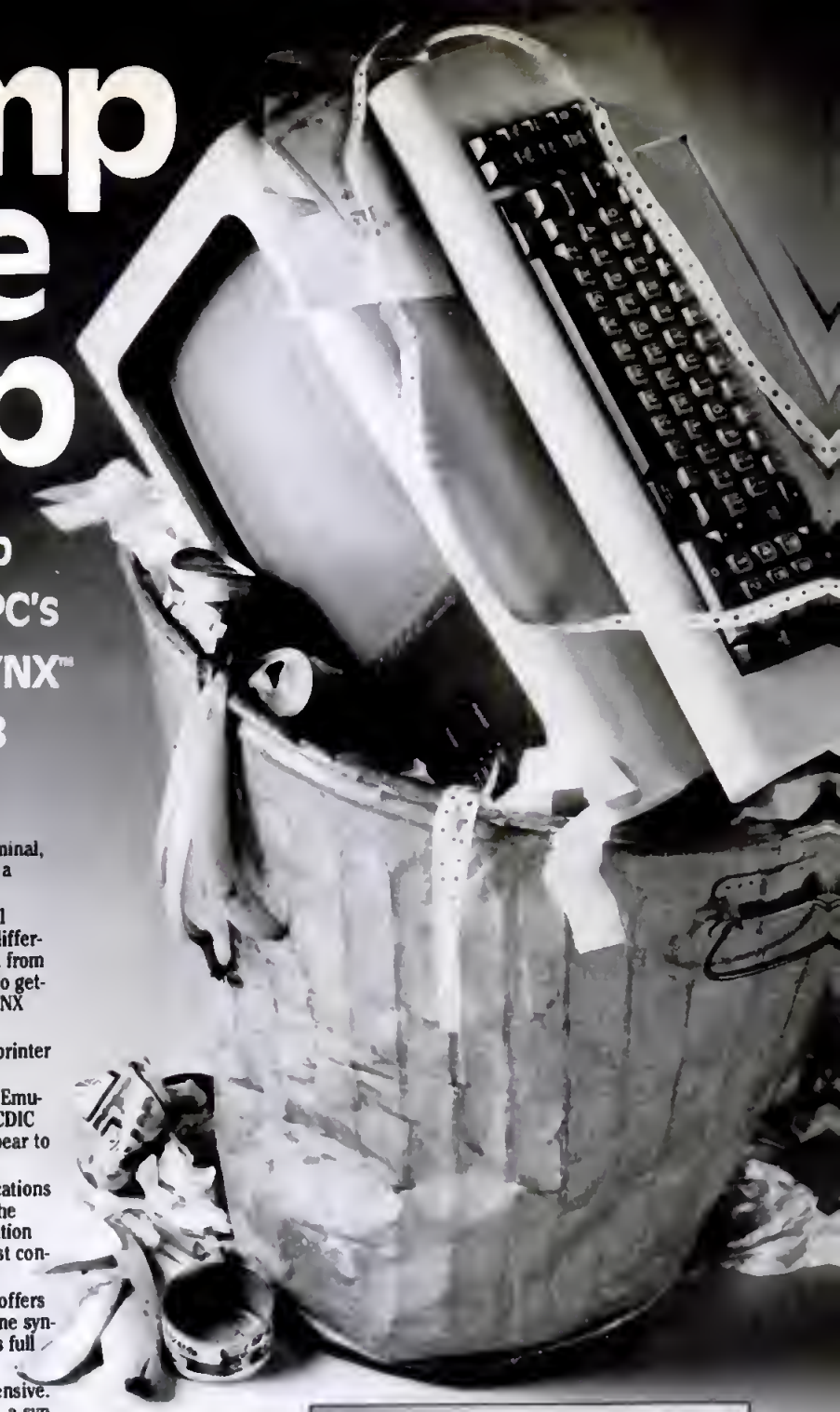
As a reviewer, I should tell you about one feature I feel could be improved. The printer easily handles single sheets of bond paper with its standard roller platen. The paper is easy to insert, and it rolls in without coming up slanted. There is a very tight fit, however, between the printhead, the platen, and the printhead cover. Single sheets often crinkle as they go through, and you have to try and wedge your finger between the printhead cover and the roller to guide them. I know these tolerances are made tight in order to minimize the noise of the printer, but a hinged cover or a better guide mechanism would make it easier to insert single sheets.

Generally, the paper handling capability of the Okidata printers is excellent. Except for an occasional piece of single sheet bond, they move paper quickly and accurately.



CIRCLE 156 ON READER SERVICE CARD

dump the dumb



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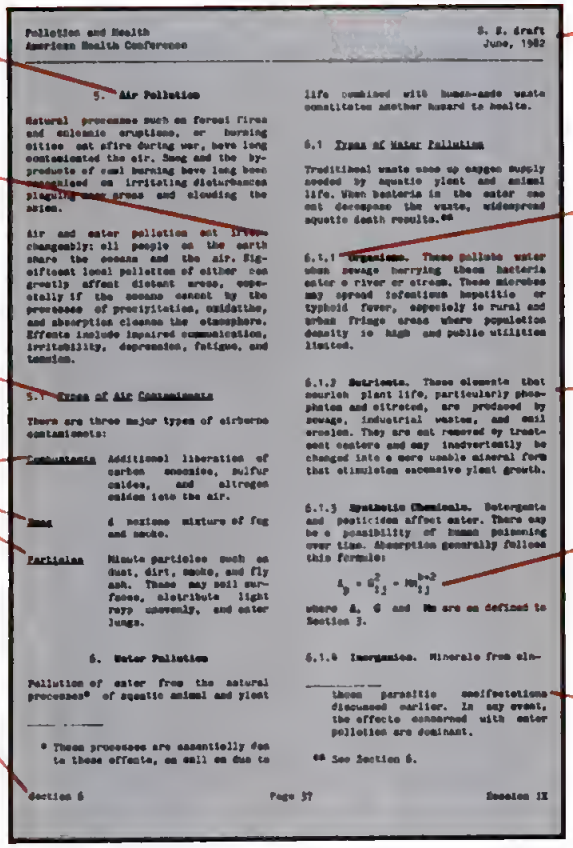

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Graphics

The Okidata Microline 92 and 93 printers can produce addresseble dot graphics in two densities: 60 by 60 dots per inch and 72 by 72 dots per inch. The phrase "dot eddresseble" means just what it seys—you heve to tell the printer where to put each dot. This is one piece where the Okidate systems have suffered because of differences with the IBM/Epson product. Because IBM chose the Epson as its printer, the mejor graphics softwere peckages heve included the code to send charts and screen imeges to this printer. Up until recently, this hes limited the ebility to send graphics from IBM PC software to en Okidete printer.

Thenks to eggressive marketing end support by Okidate, the software limitation is diminishing. The letest release of the popuiar 1-2-3 peckage from Lotus will include the Okidate mechines as a printer option and produce charts and graphs using the graphics mode. Other software houses heve recognized the popularity of these printers end have teckled the job of providing the code to use their graphics capabilities. Okideta has elso recently started to market e ROM set thet emuletes the commands used by the IBM/Epson printer. This ROM set completely does awey with the mejor interfece limitetions between these systems.

SOME CODES can be set in advance using BASIC.

Interface

The task of interfecing e printer to e computer hes two parts: the electrical interfece end the software. The Microline 92 and 93 printers can be ordered with either e parallel or seriel interfece. My personal experience is thet a parellel printer is almost elweys easier to install than one with a serial port. The standard RS-232C seriel interfece is fer from e stendard. Many computer systems do not support ell of the hendsheking signels e seriel printer can require. A piece of edvice: If you heve e choice, go parallel.

The choices in software interfeces are not so simple. If ell you ever went to do is to print out 12-cpi text without underlines, emphasis, superscript, or other features, you can simply send the charecters out the port to the Okidate, end it will print them. But if you want to use the speciel features, you heve to pass your desires elong to the printer, end that can sometimes be a chellenge.

The printer watches for commands coming down the deta streem in the form of special ASCII codes. For example, en escape charecter followed by the number 1 tells the printer to print the following text in correspondence mode. An escepe followed by the charecter C directs the printer to underline all received characters until it finds enother escape C. The problem with this method of signaling is

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that you have to figure out how to send an escapa C in the middle of your text so the printer can find it at the right time.

Some codes can be set in advance using BASIC. If you want to print out a spreadsheet using compressed print or create a lettar using correspondenca print, it is possible to send tha proper code before you go to the main program. The simple BASIC statement CHR$(29) sent out the printer port will cause the printer to operate in the compressed data mode. I have compiled a number of these commands and use them to set the printer whenever I want it to use a major function outside of WordStor or other customized programs.

WordStar

WordStor has a number of useful functions built into its menu, but it can't send the proper codes to the printer until you customize the program. Customization of the PC's version of WordStor is hindered by the unsophisticated installation program MicroPro provides for the PC. Fortunately, you can use DEBUG to enter a few code changes that cause tha program to send tha correct values for the standard Okidata printer. If you follow the instructions in the accompanying sidebar, your WordStor can tell tha Okidata Microline 92 and 93 to selectively use the correspondence moda, underline, overstrike, and perform superscript and subscript printing.

Plug'N Play

Despite tha trend toward greater support of the Okidata command set and the ability to customiza some software, there are still many programs that will not send their graphics out to these printers. The best one-time cure for this problem is to change tha ROMs in the Okidata and insert ROMs that will giva tha printer tha ability to recognize the Epson command set. Okidata has released these ROMs under the name "Plug'N Play Kit" for the IBM PC. The kit includes only two ROMs and an instruction manual.

Swapping the two new ROMs for the old ones is not technically difficult, but it requires some dexterity and care. The printer is easy to take apart, and tha ROMs are in sockets, but you have to have a small screwdrivar to get the old onas out and a steady hand to get tha naw onas in. Take care because the pins are prone to folding under instaad of going into tha hola. This condition is difficult to spot; your only indication of tha problem comes when the printar won't work. If you take a little care, you can have the new ROMs in place and the printer back "on the air" 20 minutes after starting the job.

I created graphics using Chortmon, *1-2-3*, Freize, and PC Crayon and printed them out quickly and easily using the Plug'N Play adapter kit.

Solid Value

The Okidata Microline 92 and 93 printers are reasonably priced and widely supported. Aggressive marketing by Okidata has improved their ability to interface with tha PC and PC software. These units provide good value in printing capability and reliability. */PC*

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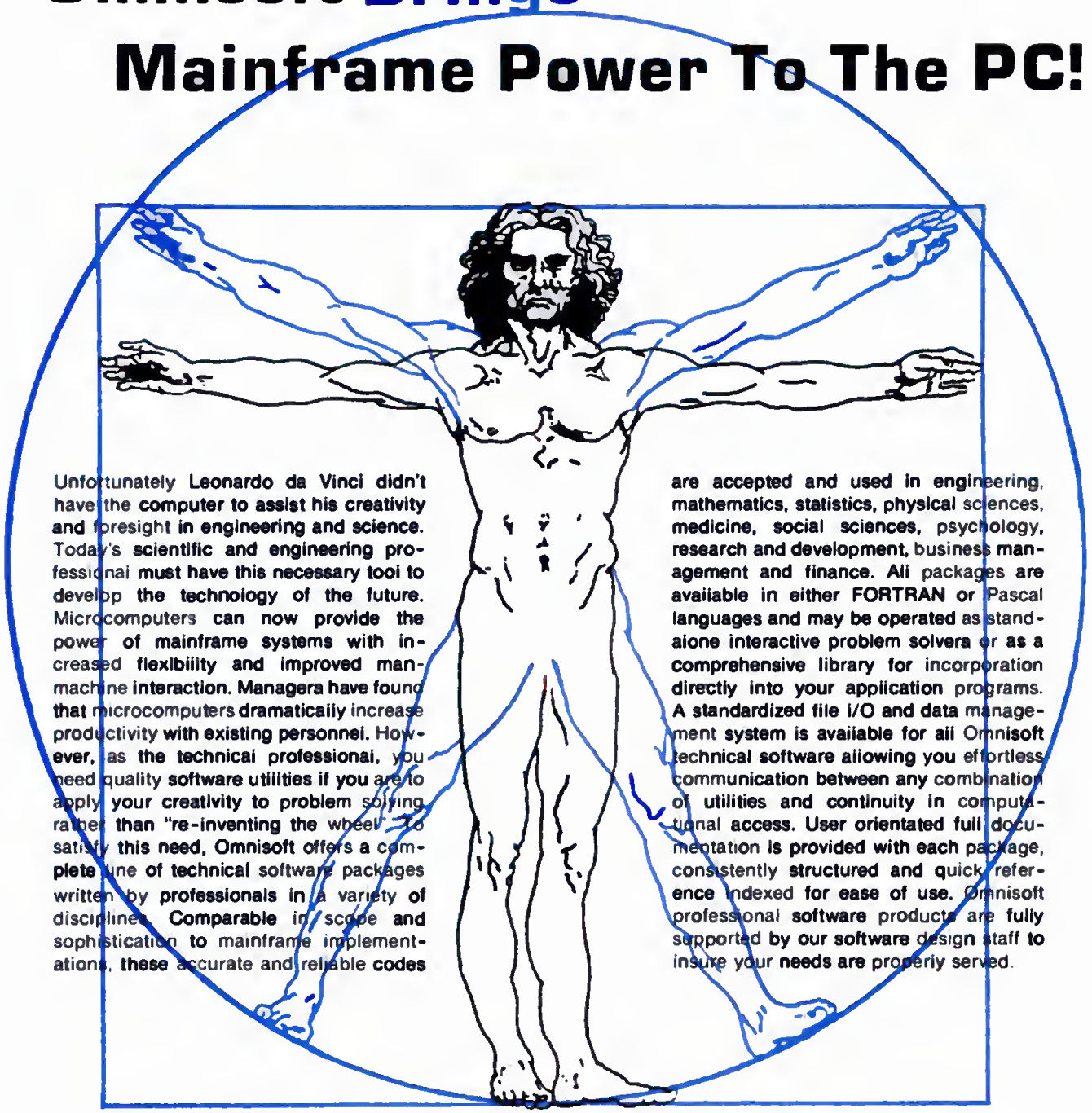

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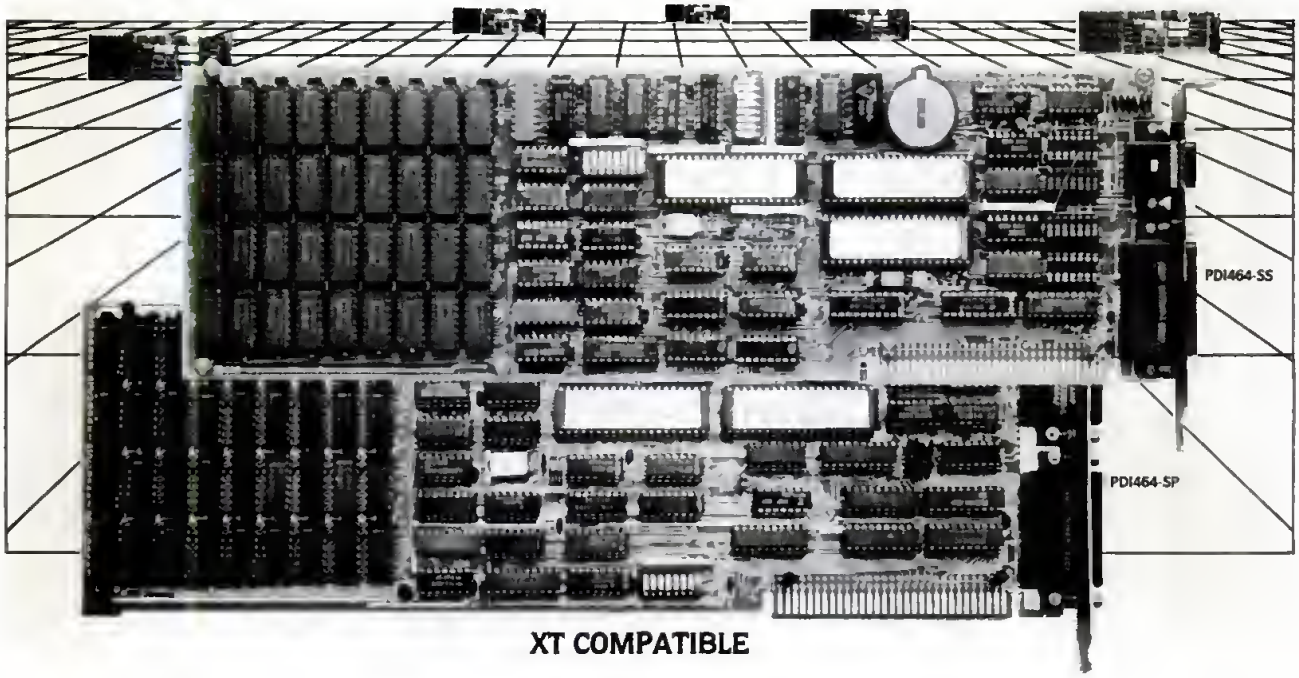

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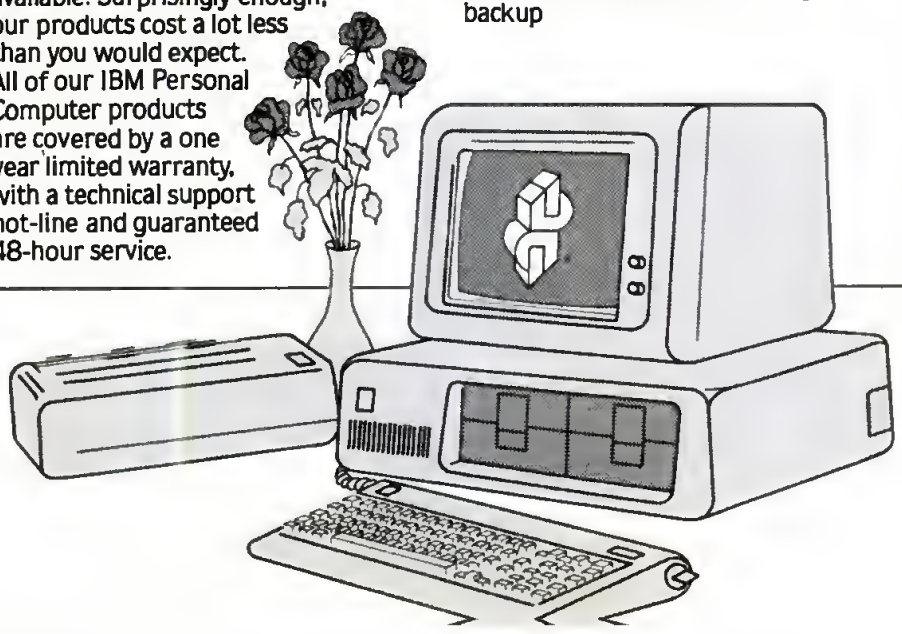

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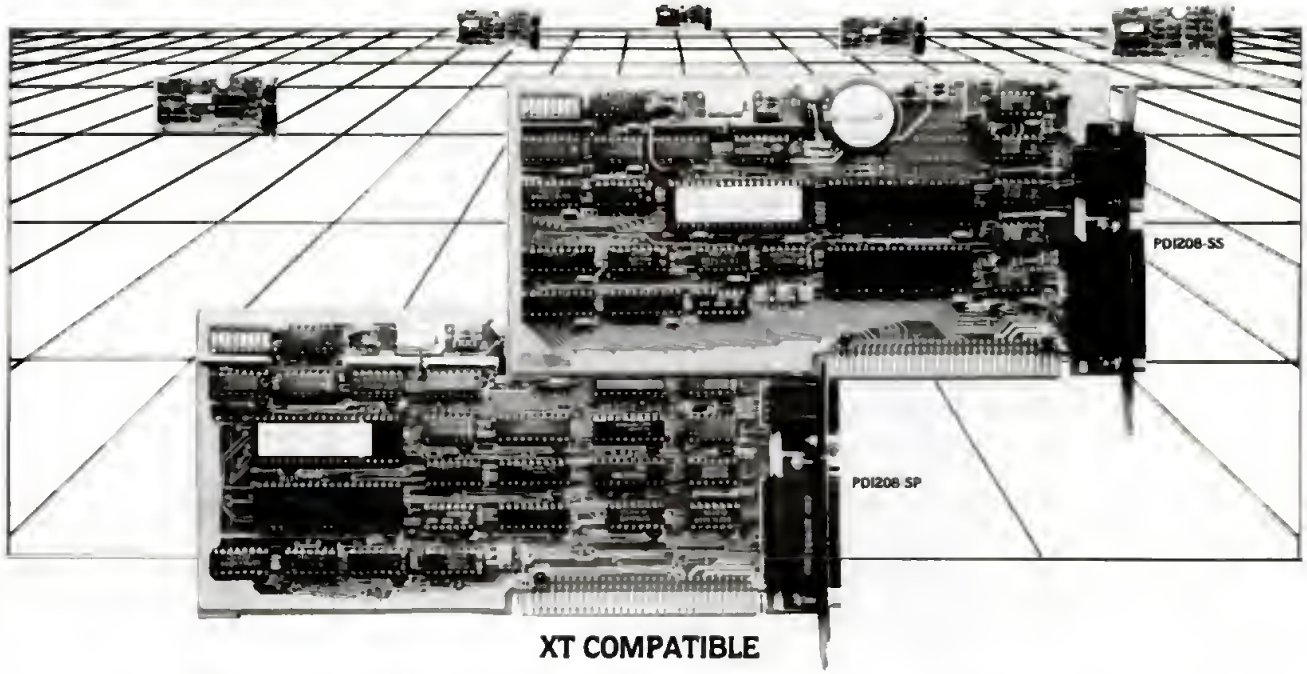

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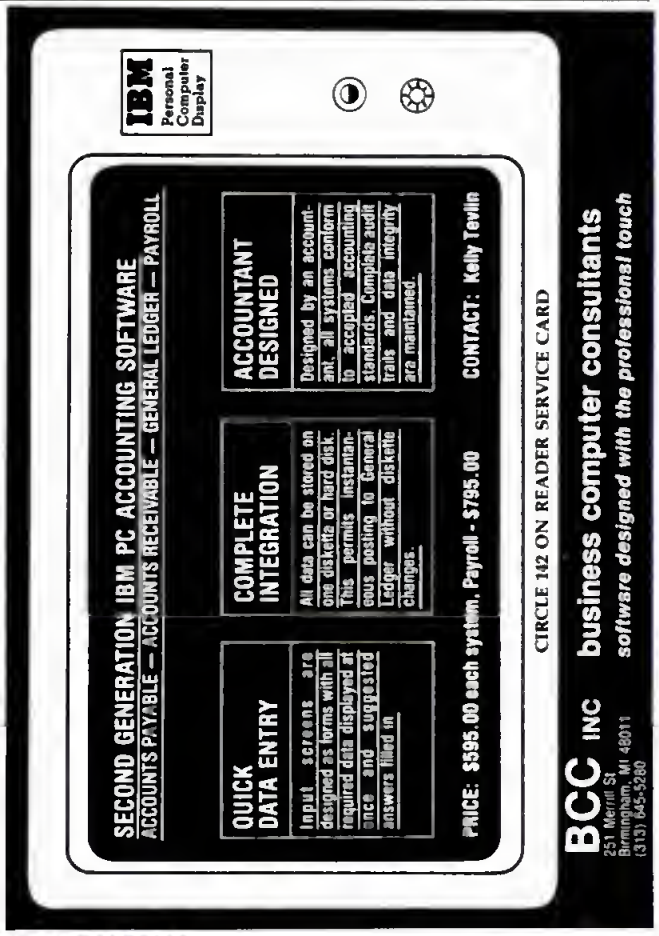

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The readership of *PC* Magazine has, in the last year, grown at a rate to match the success of the IBM Personal Computer itself. But as the number of committed readers has expanded, so has that portion of users who are not only interested in *output*—that is, using the IBM Personal Computer to better solve problems—but who care deeply about the *process* of the computer itself.

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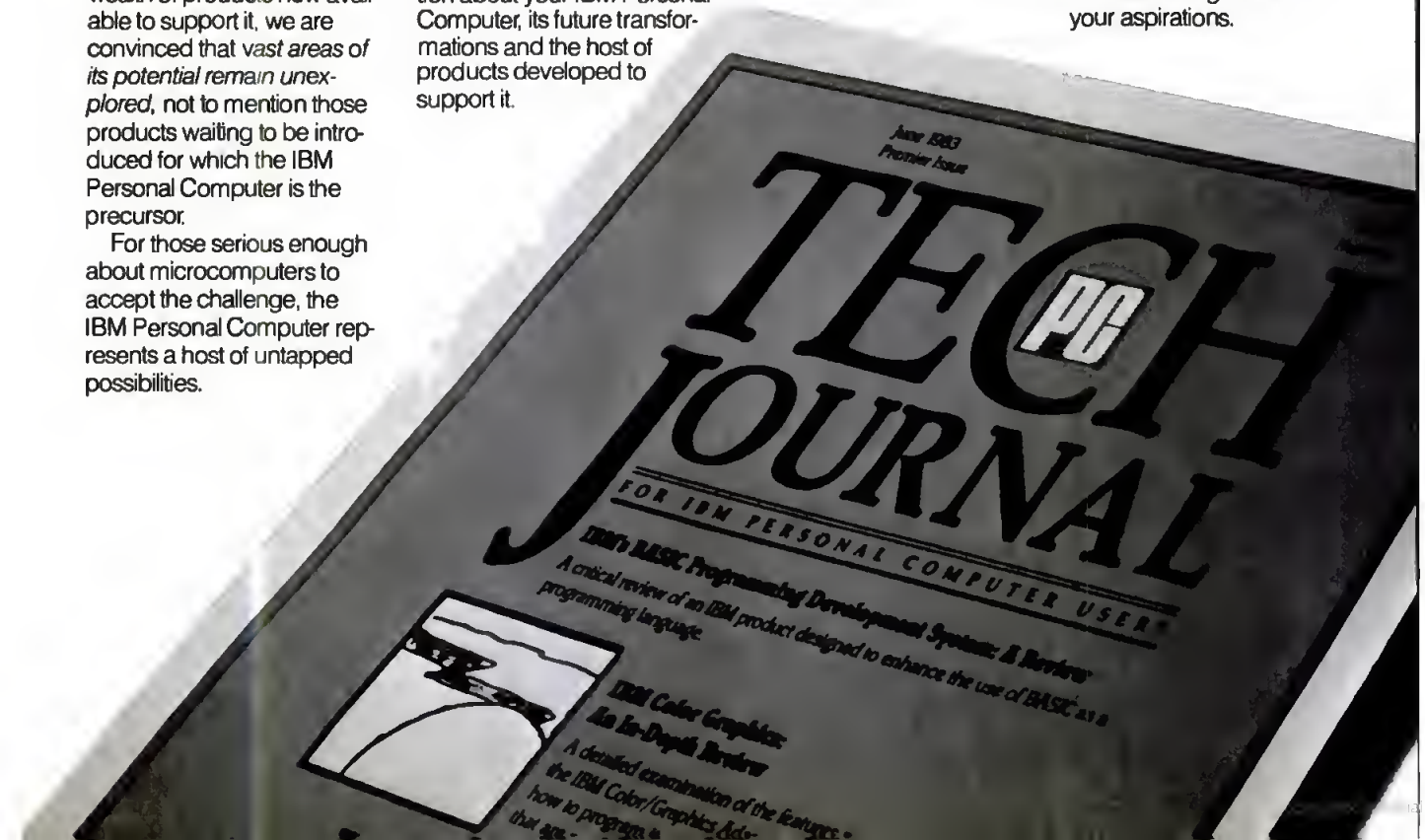

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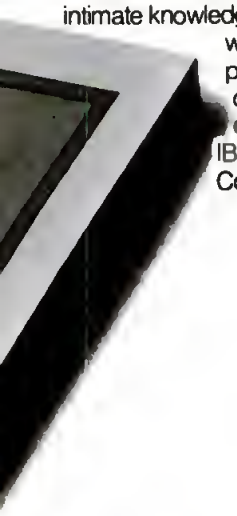

Independent businessmen and professionals who understand the increased benefits of tailoring their IBM Personal Computers to their own specific demands.

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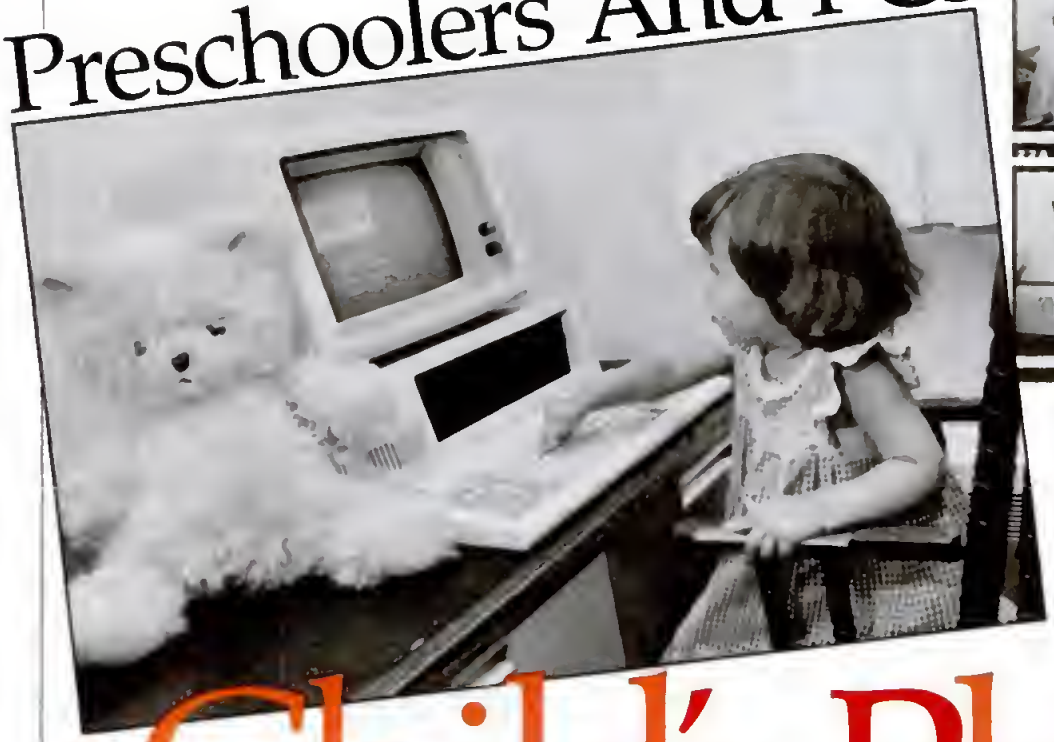
CIRCLE 440 ON READER SERVICE CARD

TRAINING/MARIANNE PAUL

As the number of computers increases, the average age of computer users has dropped dramatically. Now, it seems, it has reached down to the sandbox set.

Preschoolers And PCs



Child's Play!

"Puter, puter, puter." The chant persists in the midst of the normel household din. I sigh, bending over to put Big Bird and Smurfette back in the toy box.

"Puter, puter, puter." The song grows more intense as Samantha hops from foot to foot, round and round, faster end faster, in a kind of frenzied tribal dance. I stand up, hands on my hips, stubbornly facing my 22-month-old daughter.

"Not again." I begin. Suddenly, Samantha stops twirling.

"Puter?" she asks expectantly. I smiie. Sensing victory, Samantha giggles devilishly. For the third time that day, we will play with the "puter," Samentha's word for our IBM PC.

But How Young?

The average ege of the computer user is dropping drametically. It is not uncommon for children as young as 8 years old to join computer clubs at school. And, in some instances, students as young as 5 are taught the fundamentals of "reading, 'riting, and 'rithmetic" through computer assisted instruction (CAI). It is only a matter of time (and money) before microcomputers with nicknames such as the "Bionic Beaver" (the unofficial title of the Canadian Educationel Microcomputer being developed by the Ontario Ministry of Education) are accessible to every child of school age.

But whet ebout the teddy bear and sandbox set: preschoolers? With the influx of PCs In the home, more and more children are growing up with computers. To these youngsters, tbe computer is not

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The author, Marianne Paul, and her daughter, Samantha at the IBM PC.

some alien mechanism but e femiliar household item. At 2 a.m., Dad may try to coax the newborn asleep, rocking the credle with one bend and pecking ewey et the keyboard with the other. Or Mom mey enter the latest bank statements while baby practices rolling over on e blanket et her feet. Or big sister may introduce little brother to the visuel delights of Poc Mon before he can say "da de."

But how young can a child actuelly *aperate* a computer? My husband and I bought our IBM PC when our deughter, Semantha, was 22 months old. It was not our intention to teach Semantha to use it. We did not think e toddler wes capeble of "computing" without disaster. Orange juice stains on the cerpet, cookie crumbs in our bed, a toothbrusb flusbed down the toilet convinced us thet it wes e closed case. The IBM PC was off-limits.

Two months have passed since our initial decree. Samanthe cen now turn the computer on, and with help, insert the disk end loed and run e simple program. She can escape from her favorite program and return to it without prompting, a three keystroke operetion. She has learned the alpbebet vie computer, and can identify and strike all the letter keys on the keyboerd, as well as the spece bar, the Escape key, and the Enter key. She can play simple games, pressing specific keys to meke deliberete choices. Sbe can remove the disk end shut the computer off. "Puter," "scepe," "space bah," "floppy dis," and "dis dribe," are all part of her vocabulary.

All this, without mishap—not even so much as a peanut butter fingerprint smudge on the monitor.

Whet a child may learn vie computer depends upon his age and mentel and motor development. Samantha began computing at 22 months simply because that was her ege when we bought our PC. She could just es easily heve started at 18 months, or even 12 months for all we know. Many 1-year-olds are able to associete words witb objects. They enjoy looking at picture books, and when asked, can identify such objects as boy, cat, dog, and car. These children may not be able to master number or letter recognition, or have the fine motor skill to strike just one key on the keyboard et e time, but they can learn and prectice word-picture association on a computer with graphics. "See

ORANGE JUICE stains on the carpet, cookie crumbs in our bed, a toothbrush flushed down the toilet convinced us that it was a closed case. The IBM PC was off-limits.

the tree? Point to the picture of e tree, Johnny," a parent may ask his toddler while they sit together in front of the monitor.

In the same manner, an 18-month-old child mey point out parts of the fece or body, a 2-yaar-old may distinguish colors, a 3-year-old mey recognize shepes, and a 4-yaar-old mey identify simple words.

Computer in the Nursery

The Byte Size Computer Acquaintanca Center, in Oakville, Ontario (Canade), introduces preschoolers between the eges of 3 and 5 to computers through hands-on use. At any time, approximetely 350 children are registared in the classes, attending half-hour sessions once a week. In special cases, children as young as 2 hava been taught to operete e computer. One little girl who has cerebral palsy learned to relax the muscles of her arm and hend through e specially dasigned therapeutic program.

Stan Squiras, director of Children Services at the Oekville Public Library (tha Computer Center is part of the services offered by the library), recalls only two or three preschoolars since tha Center's opening in 1979 who did not learn to use e computer or enjoy the experience. The instructors find children instinctively curious and seldom intimidated in the presence of computars as adults sometimes are. Preeschoolers, in particular, demonstrete rapid improvament of hand-eye coordinetion, mastering basic operation quickly.

The childran work tha computers thamselves, usIng e minimum of three diffarent kinds to encouraga versetility. Tha core curriculum includes recognition of shapes and colors, size varietions, the alphabet, and numbars as wall es concentration and memory skills, word recognition, sentence building, and simple arithmetic. With e ratio of one computer per child, and one teacher for every four pupils, the curriculum is adaptad to suit the needs of the individuel. Johnny may be working on colors, while Susie is reading e story.

Television vs. Computer Learning

Television has brought early childhood education into tha playrooms of tha everege household. Twenty years ego, a child who entered kindergerten able to count, recite tha elphabet, or reed was considered e genius of sorts. Now, it is commendebla but not axceptional for a 3-year-old to know his numbers, letters, shapas, and colors, laarned from watching educationel programming such es "Sesame Street."

> *THE advantage of the computer over the television set is that learning via computer is interactive.*

Tha edvantage of the computer ovar the television set, according to Stan Squires, is that learning vie computer is interactive. The computer responds immediataly to tha child's input, and in meny instences, invites responsa from tha child.

Educators tall us people laarn best and remember longer if they ectively participate in the laarning process. Wa retain roughly 30 parcent of whet we see and haar, but 70 percant of what we see, haar, and do.

Wetching television is e passive activity. On the other hand, operating a computer is ective. In fect, the operetor, even if he's only 3, is in control. This in itsalf is a delight to e child whosa world seems so full of limitations—too short to raach tha cookie jar, too littla to cross tha street alone, too young to go to school, . . .

Samenthe's biggest computar thrill wes when she first reelized thet she manipuleted the "pictures" on tha monitor. "Sammi get, Semmi get," she crowed proudly as she struck the Escape key, then retriavad her favorite program.

Computer at Risk

Perhaps the most common argument against e preschooler using the family PC is the potentiel for damaging it.

In tha long tarm, more damage may occur to the computar if parents do not allow their preschooler eccess to it. Children imitata edults. They enjoy nothing better than a good game of "pretanding they are Mommy and Daddy": dressing up

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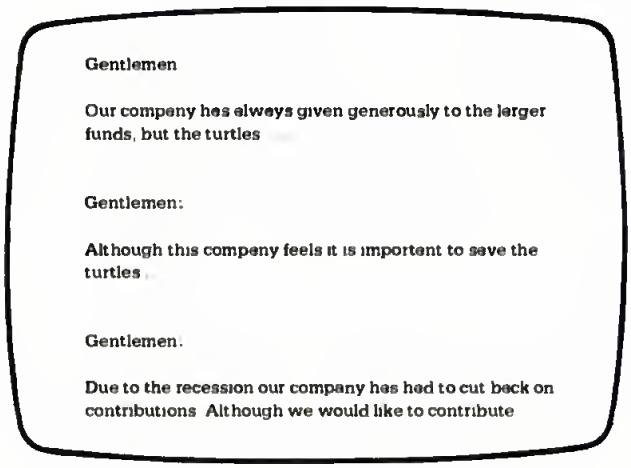

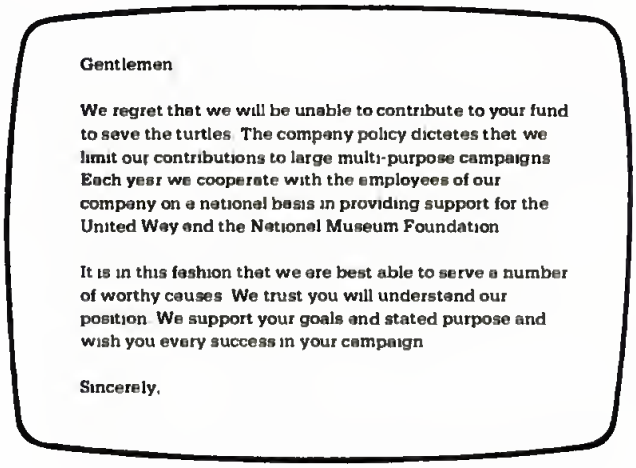

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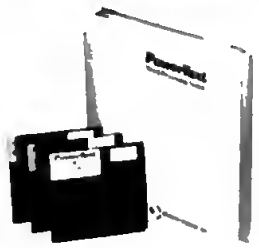

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CIRCLE 144 ON READER SERVICE CARD

in grown-up clothes, having a tea party, putting teddy bear to bed, playing with the computer, . . .

It soon became obvious to us that Samantha was determined to try her hand at computing. She wanted to do what we were doing and we were spending a lot of time tapping away at the keyboard. Sooner or later, with or without our permission, she was going to find out firsthand what the big fuss was all about.

WE DECIDED that our daughter could do less damage supervised than unsupervised; hence, her first computer session.

We decided that our daughter could do less damage supervised than unsupervised; hence, her first computer session. From the beginning, we expected Samantha to act in a calm, quiet manner in the computer room. There are other rooms in the house for boisterous play. "Gentle" and "soft" are words we use often, not because Sam is rough with the equipment, but to reinforce how we want her to behave. "Press the space bar *softly*," we emphasized when she was first learning to keyboard. Now, we might tell her, "Open the disk drive door. Be gentle. Take out the floppy disk. *Softly* does it. Very Good!"

Preschoolers are sticklers for routine and Samantha has developed her own set of computer habits. She polices our behavior, insisting we obey her rules, too. And for the most part, her rules are sensible. Floppy disks, for example, must be put in their envelopes immediately after use.

Initially, we limited Samantha's computing, not letting her shut the PC on or off or handle the diskettes. We discovered that, once she had mastered one aspect of the computer, she was curious about another. It was easier to teach her proper use than tell her, "No, you can't do that."

At the Computer Center, the instructors put tape over the keys they did not want the preschoolers to touch such as Delete and Escape. They soon found, however, that these were the first keys the preschoolers tried to use simply because they were taped. Now, the tape has been removed and the off-limits ban lifted. Instead, if a child accidentally, or through experimentation, exits from a program or deletes information, the instructors turn the situation into a lesson in computing.

Time has demonstrated that preschoolers, as a group, inflict the least wear and tear on the equipment at the Computer Center. The touch of a small child on the keyboard is very light and if a finger must be pointed at the roughest group, it points to teenagers. In general, very little damage occurs, no insignificant fact considering that 3,000 people of all ages use the computer at the Center during the average week.

Keyboarding

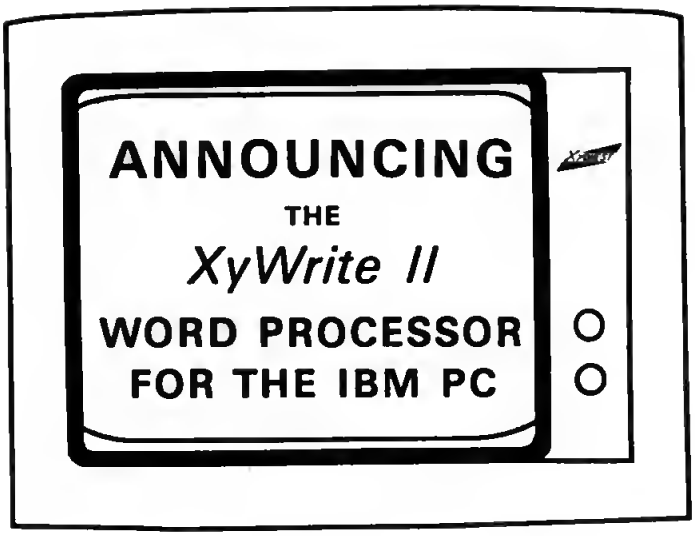
By the time a child is 24 months (and sometimes earlier), he has usually developed the fine motor skill and hand-eye coordination to accomplish the physical action of keyboarding. After all, it is not unusual for a 2-year-old to turn the pages of a book one by one, ring a doorbell, switch the lights on and off, string together large beads, build a tower of blocks, pick up pennies, and so on . . .

The most important keyboarding skill a preschooler must learn is how to press one key at a time. With very young children, the natural tendency is to push all the keys at once with the flat of the hand.

AN UNEXPECTED and pleasant by-product of Samantha's keyboarding was her mastery of the alphabet.

Or the child will hold down his finger too long, causing repeats on the screen.

We used two methods to teach Samantha proper keyboarding technique. First, we allowed her unlimited and unsupervised access to our old typewriter. It was her very own "puter." We set it on a small



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CIRCLE 509 ON READER SERVICE CARD

table and let her bang eway to ber heart's content. From observing us at the IBM PC, she soon picked up how she wes supposed to keyboard.

Second, I introduced Sem to the PC keyboard by sitting her on my knee. This way, I could menipulete ber ections. By bolding her hand and finger, I showed ber how to push a single key. Most important, my busband and I dished out the preise liberally, letting her know that she was doing a good job and that we were pleased.

Initially, ell Samantha's keyboarding was done with one of us physically controlling ber band movement. Now, she cen keyboard on her own but still likes to be beld. Computlng, to Samanthe, is something we do together.

An unexpected and pleasent by-product of Samantha's keyboarding was her mastery of the elphabet. Within e 2-week period, sbe could recognize and name a third of the alphabet. Now, just turned 2, she knows all 26 letters, elthough not in sequence. Her alphebet tends to follow the order of the keyboard, Q-W-E-R-T-Y . . . We ere working on ABC.

MAKE THE experience enjoyable and praise your child's every accomplishment.

Byte-Size Software

Sementhe's fevorite software is not commercially produced for the preschooler merket. It is Version 1.1 of DOS. The sample music progrem is a perfect introduction to computing. The menu offers a choice of 11 songs, feeturing such preschooler favorites as "Pop Goes The Weazel" end "Yenkee Doodle." A child soon figures out thet by pressing e specific key, he is rewarded with e specific tune. The progrem is elso visuelly enterteining. A "dencing note" hops ebout on e pieno keyboerd displey, landing on the keys as the corresponding note sounds.

It was this program, In particuler, that introduced Sem to the alphabet. Sba identifies the songs with the letter pressed to retrieve them. For example, "The Mexican Het Dance" is the "D" song. Using the music program es "home base," we added other keystrokes, graduelly stringing together e sequence thet allowed Sam to escape and "get back" the songs on her own.

We use this building block epproach to teach Sam besic computer operetions es well. For axample, she first learned bow to turn the computer on and off. Later, we edded opening and closlng the disk drives, and then insertlng and removing the diskettes. Now we ere working on F3, Load end F2, Run.

Preschoolers have amazing memories. If you break computer skills into small parts, string these parts into sequences, and encourage frequent prectice sessions, you can teacb even very young children simple computer operetions.

Tbe software eveileble for prescboolers and the IBM PC is limited. With the anticipeted boom In the educational use of microcomputers, we hope more software will be developed for very young children. There are, however, some excellent programs. Spinnaker, for example, offers "byte size" computer users fun and learning with *"Hey Diddle Diddle,"* "Foce *Moker,"* "Kinder Comp," "Rhymes ond *Riddles,"* and "Story *Moker."*

We found, in our own library of software, games thet were not manufectured for preschoolers, but were easily adapted to entertein end teecb Sam. She doesn't mind being "hung" while pleying *Hang*mon on the Friendly Ware PC Introductory Set—she thinks that she has won the game.

Teeching e preschooler to use e computer is like teeching a preschooler any other skill. The ectivity, primarily, must be fun. You can't force your kid to compute by tying him to the cheir. But make the experience enjoyeble and praise your child's every eccomplishment, and you'll soon have one more femily member demending his feir share of computer time.

Who knows? You may have to buy a second PC—one for the adults, end one for the "kid." */PC*

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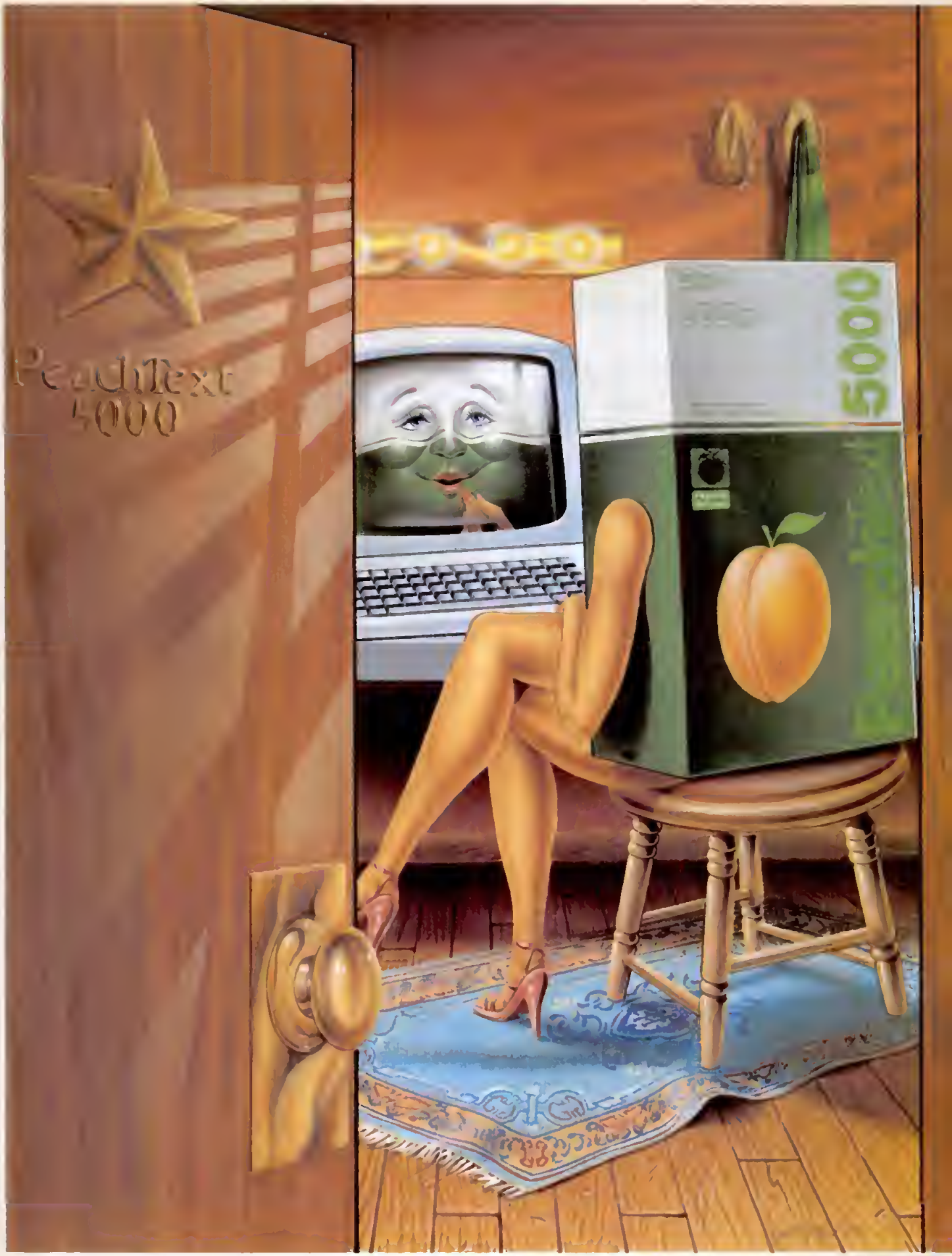
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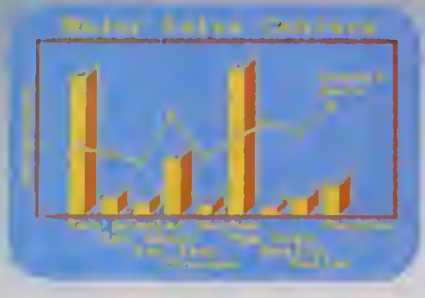
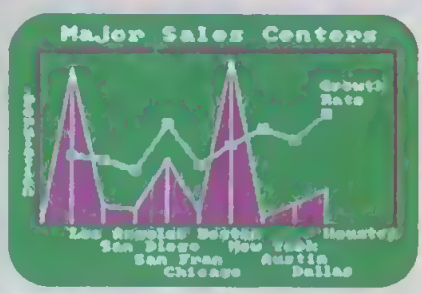
UltraFile has an easy-to-use graphing system. "Point" to the kind of graph you want to see (there are many to choose from) You can even do calculations right on the screen!





SAVE COUNTLESS HOURS.

UltraFile can manage and organize your information in hundreds of different ways, no matter what your need. Here's just one example:

Suppose your company does business nationwide. You as sales manager know sales can be increased dramatically by concentrating on cities that have a population of at least 500,000 or an average income of at least $9,500. How can you find out which cities fit into those categories?

UltraFile can tell you. And do the calculations. And do the selections. And do the formatting. And give you the information that meets your criteria. Instantly.

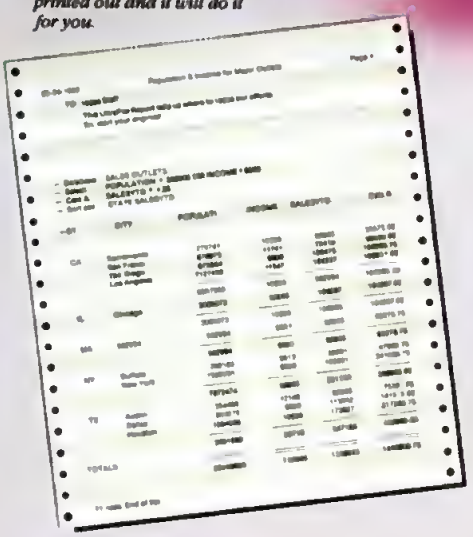
UltraFile can pull data out of a file of information and do calculations and even make projections.

If you just want to browse or look through your "file," you can choose to see every other item or even every seventh item, forward or backward. It's up to you. When you find the information you want, you "point" to it and it is automatically highlighted on your screen, keeping you from losing your place.

But more importantly, the information is automatically "remembered." And that means you can get the interesting or highlighted information sorted, calculated and formatted any way you want. Instantly. UltraFile even lets you add new columns of information and make revisions at any point without having to start all over. Unlike other programs, UltraFile is very forgiving if you change your mind.

Now suppose you'd like to have a printout of the information on your screen. Creating a "report" is easy. Tell UltraFile in plain English exactly how you'd like to see the information and it will do it for you. It's extremely flexible.

It's easy to create a report with UltraFile Just tell UltraFile in plain English exactly how you'd like to see the information printed out and it will do it for you.

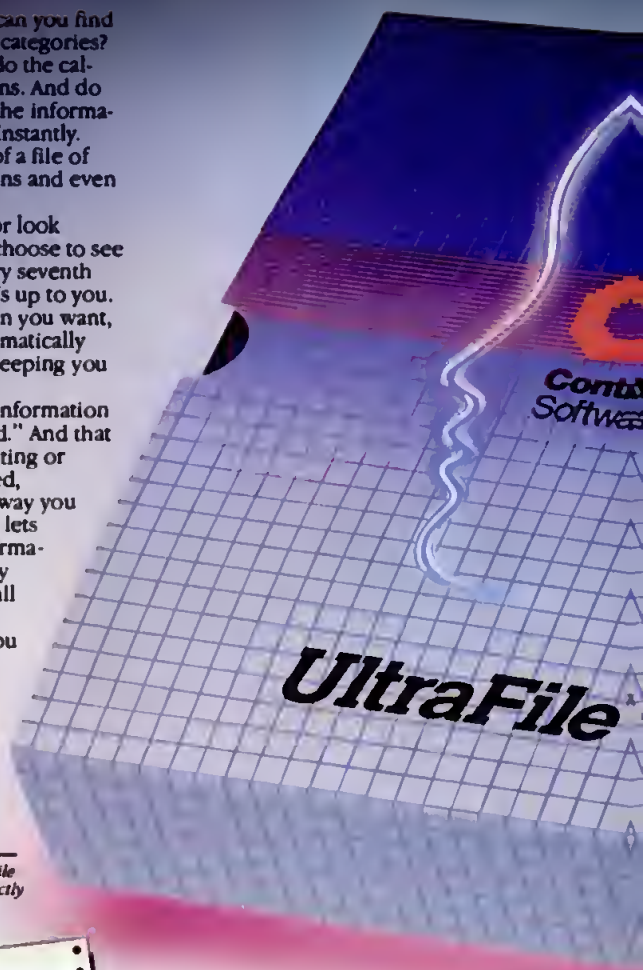


TYING IT ALL TOGETHER.

Being able to visualize your information graphically is also important because it allows you to make comparisons and spot trends more easily.

UltraFile has a very easy-to-use, yet sophisticated and accurate "graphing" system. And it's fun to use, too.

Suppose you'd like to see the sales report information for cities in graphic form to make a visual comparison. Just "point" to the kind of graph you want to see, whether it's a 3-dimensional bar, circle or area graph (to name a few), and



UltraFile:™

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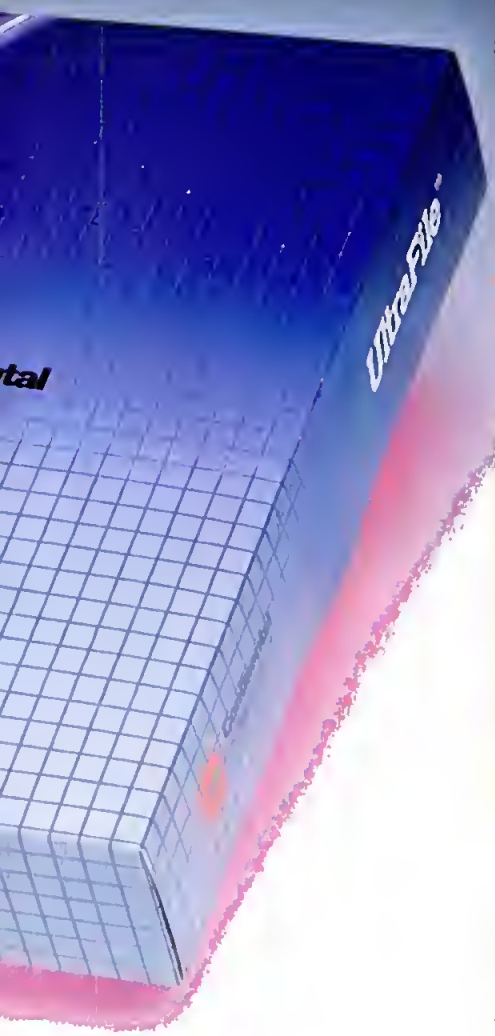

UltraFile does the rest. It will find the information, do the calculations and create the images for you. In seconds.

But one of the best parts about UltraFile's graphing capabilities is the ability to actually do calculations right on the screen.

Take the average sales report information: You can pinpoint the area you're interested in and get an exact translation into numbers from where you are on the graph.

For example: If you'd like to find out what a 25% increase in sales would mean in those cities which have a population of at least 500,000 or average income of $9,500, just press a few buttons and the graph will change before your very eyes. It's that easy.

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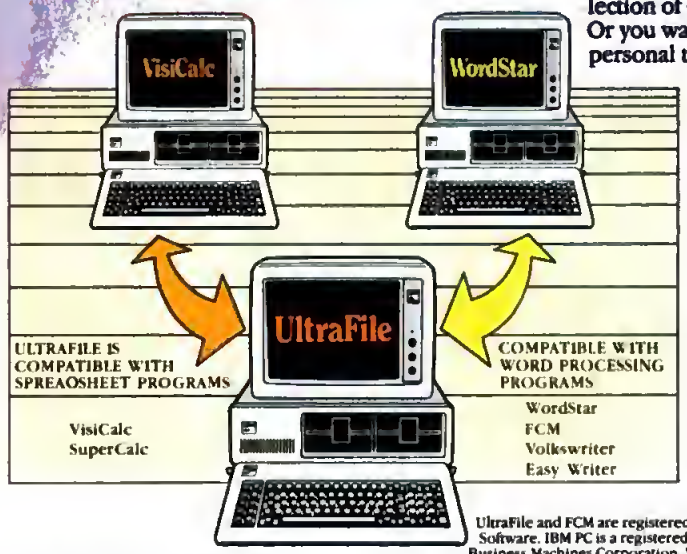

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UltraFile gives your spreadsheet and word processing programs a lot more muscle.

The sales manager's example is just one way of solving one problem. UltraFile can just as easily and efficiently solve *your* particular information problems.

The point is, you create your own headings with your own information and UltraFile does the rest. Whether you want to know the total value of your inventory or which items need to be reordered. Or you want to find out what would happen to your profit if you increased the price of item "A" by 10%.

Or if your need sales figures for last quarter from all clients in the western region. Or you want to catalog your vast collection of Chinese recipes. Or you want a list of your personal tax deductions.

The list is endless. And UltraFile can do it all for you.

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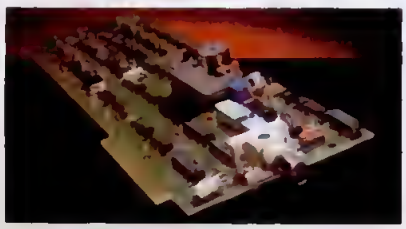

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CIRCLE 426 ON READER SERVICE CARD

*IBM APL and APL*PLUS/PC, two versions of the powerful and simple language APL, are reviewed, and benchmark comparisons are presented.*

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CIRCLE 694 ON READER SERVICE CARD

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CIRCLE 693 ON READER SERVICE CARD

People who are familiar with the language APL fall into two categories: those who love it and those who hate it. What anthusiests find so appealing about APL has to do with whet mathematicians call "alegance." APL is concise, consistent, reesoneble, end never arbitrary.

Programming in APL is easy and fast, because the language is modular, and it's oriented toward the usar's neads, rather than its own internal workings.

APL is simple, yet powarful. The introductory chapter of IBM's new APL PC menuel puts it this wey:

> A programming language naeds both power and simplicity. By power, we mean the ability to handle large or complicatad tasks. By simplicity, wa meen the ebility to state what must be done briefly and neatly, in e wey that is easy to read and easy to write. You might think that power and simplicity are competing requiremants, so that if you hava one, you can't have the other, but thet is not necessarily so. Simplicity doas not mean that tha computar is limited to doing simple tasks, but thet the usar has a simple way to writa instructions to the computer. The power of APL as a programming languaga comes in part from its simplicity.

APL enthusiasts find that it is graceful to work with, because once they become competent with the language, they begin to think in APL. And those who think in APL heve the power and facility to make e lot happen with very little, very quickly.

Detractors of APL dislike it because of its notetion system: APL codes are given in symbols, not words. Codas other than

your own are difficult to read, even for experienced programmers. In practice, though, this is rarely a problem, since most users seldom need to read one another's code. Because of its unfamiliar notation system, APL appears formidable, but what most people don't realize is that APL is actually simpler and easier to learn than BASIC.

IBM Personal Computer APL was developed by the IBM Madrid Scientific Center. At a price of $195, the package includes a non-copy-protected system disk, a boxed reference manual, and a set of keyboard decals with APL characters printed in red. These decals are transparent, so the IBM PC keyboard characters can still be read for non-APL work.

Concurrent with the announcement of its version of APL for the PC was IBM's announcement of the 8087 arithmetic co-processor chip. Officially named the IBM Personal Computer Math Co-processor, it is a hardware requirement for IBM's APL system. This chip will significantly accelerate floating-point arithmetic, logarithmic, and trigonometric functions. The 8087, which is priced at $260, comes with a heat shield, and with what IBM calls a "current level" 8088 chip, to replace the one now in your machine. The replacement is necessary because some of the early 8088 chips intermittently create random stoppages when functioning with the 8087 co-processor. So, the current-level 8088 chip is included to ensure optimal performance. (Note: Contrary to rumor, these chips do not come in matched pairs. If the 8088 in your PC has two copyright dates, "© '78 '81" on the third line of text, or if it is marked "8088 S4716," no replacement is needed.)

APL*PLUS/PC, STSC's implementation of APL (see "PCAPlication," PC, Volume 1 Number 11) is likely to be IBM APL's major competitor. It is priced at $595. The system does not include the co-processor, but unlike IBM APL, APL*PLUS does not require one. There are many significant differences between these two implementations, so don't jump to the conclusion that the lower-priced IBM version is the one to buy. Prospective buyers will have some difficult trade-off assessments to make when choosing between these products. The two packages will be compared throughout this review.

Limited Workspace

The IBM APL workspace consists of two parts: the main workspace and the elastic workspace. In the main workspace, which is limited to 64K RAM, all APL programs, variables, and matrices are created and modified. The elastic workspace makes use of the remaining free memory. If space is needed for an operation in the main workspace, every APL object not currently required can be stored in the elastic workspace and returned when needed. This can be a considerable limitation, especially since IBM's APL has a maximum of 32,767 bytes for an APL object. In contrast, APL*PLUS makes use

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of ell free memory for a single, fully operational workspace, and has a maximum of 65,536 bytes for an APL object.

Many of IBM APL's system capabilities are handled by auxiliary processors, which must be called in by name at the time APL is loaded. These processors, which make use of a shared-variable syatem, control the graphics printer, BIOS/DOS interrupts, full-screen display management, DOS file management, asynchronous communications, and music generation. Advanced programmers can build their own auxiliary processors to perform tasks not directly supported by APL.

AFTER ALL, BASIC also has a 64K limitation and doesn't even have an attic in which to toss things it doesn't immediately need.

Although you can increase workspace memory by calling in only those auxiliary processors that you need, once you've done so, you ere stuck with your decision. Should you change your mind and decide, for instance, that you do need the printer after ell, you can't just call it in. You have to start over again by rebooting the system. In APL*PLUS, however, all system capabilities are available at any time through a bighly flexible collection of over 100 system functions and variables, which can be Invoked under progrem control. This is not to say that APL*PLUS's capabilities are always superior—they do not, for instance, provide e shared-variabie system—but simply that IBM APL has some serious storage limitations, and efforts that can be made to minimize the problem are generally awkward to carry out. To many users, this may not be an issue. After all, BASIC also has e 64K limitetion and doesn't even have an attic in which to toss things it doean't immediately need. But for those who need to perform diadlc operations on large floating-point arreys, the IBM version of APL may not be the system of choice.

Other important features of IBM's package include the ability to define up to 50 screen fields, for use In developing interactive epplications; event and error handling; a convenient formatting capability; graphics capabilities; the ability to communicate with an APL system on a host IBM 370 mainframe; a file manegement capability for APL or DOS files; and a well-developed facility for generating muaic.

APL*PLUS doesn't yet have graphics capabilities, and its muaic capabilities fall short of IBM'a. Otherwise, the two systems are quite competitive. STSC allows you to program 30 "multikeys," while reserving an additionel ten for system use. IBM APL allocates all function keys to the system, making no provision for definition by the user. APL*PLUS'a file management capabilities are much more developed, especially its shared-files facility, which incorporates well-designed security features for access control in a multi-user environment. Device control and communications in APL*PLUS are through systems functions and through the use of shared files, rather then by means of auxiliary processors as in IBM APL.

Documentation

The languege APL has a long tradition of providing clear, well-written documentation and easy-to-use tutorials. The IBM APL manual makes a strong break witb this tradition. Its menual is almost, but not quite, as frustrating as the infamous original WordStor menual. Part I, the *Operating Guide*, is particularly poor, especielly in the sections on auxiliary processors. Part II, the *Reference Guide*, which deals with the language itself, fares much better, but even here there are problems. For instance, a chapter on function definition begins with canonical representation rather than with the normal form of program

I HAD found a bug alright: It was a bug in the manual.

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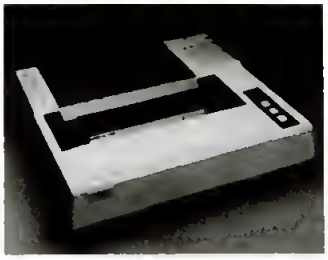

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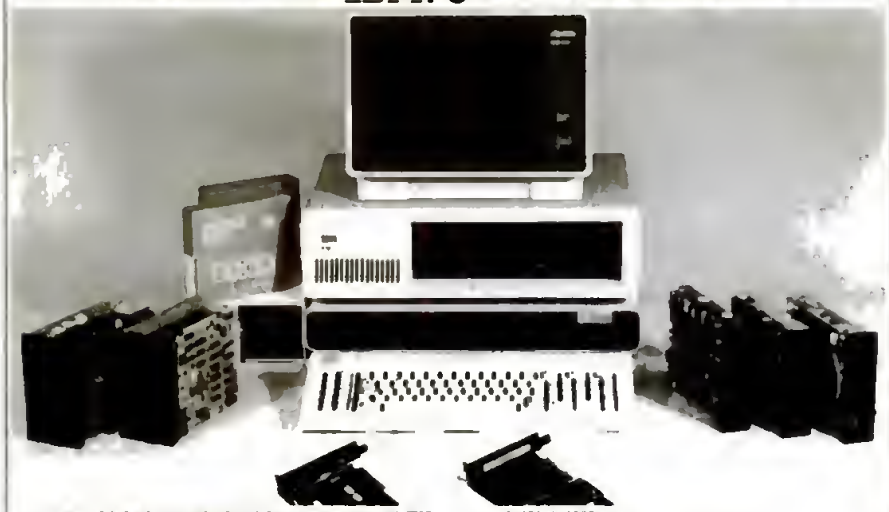

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construction. (Canonical representation has to do with changing line statements in another program, so they can be invoked by the original program. It is obviously very powerful stuff, but hardly the first thing to present to someone who doesn't yet know how to program in APL.) .

The section of the manual that deals with workspace management is also weak. Instead of the classical APL)COPY command, IBM APL provides a new)IN command for this purpose. However, when I tried to use it, I repeatedly obtained the error message NOT FOUND for objects and workspaces that were demonstrably present on my disk. Thinking that I had discovered a bug in the system, I made a number of calls to Boca until I finally got to talk with a knowledgeable person. It turns out that IBM APL saves workspaces in two forms: transfer form and APL form. A save in the transfer form (which uses more storage than the APL form) is accomplished by the system command)OUT. Objects can be copied by)IN from workspaces saved in transfer form, but not from those saved in standard APL form, with the)SAVE command. I had found a bug alright: It was a bug in the manual, which inexcusably fails to explain clearly this unorthodox, cumbersome, but important, procedure in APL workspace management.

IBM's APL manual gives examples of program listings but offers no tutorial help for beginners. The APL*PLUS manual, however, is replete with tips and program listings that illustrate various points. These listings, for the most part, concern utilities, which are likely to be useful tools for the programmer. In addition, the APL*PLUS manual includes 14 distributed workspaces containing a wide variety of programs covering file management, formatting, communications, elapsed stamp measurement, statistics, function keys, text input, search routines, an APL drill and practice course, and more. Furthermore, STSC provides two excellent tutorial volumes, one of which is designed especially for beginners. And, while the APL*PLUS manual does have some shortcomings, (see "PC APLication," PC, Volume 1 Number 11), it is vastly superior to IBM's.

Considering the generally low standards that prevail for manuals, perhaps my assessment of the IBM APL manual is too harsh. It is probably no worse than

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meny of those that have been issued for some of the popular langueges end progrem packeges. But I expected more from IBM, especially considering the high quality of its BASIC menuel and the superb manuel it developed for EasyWriter 1.1.

Character Sets

IBM's APL charecter set is software genereted; therefore, unlike APL*PLUS, it does not require e speciel charecter chip to produce APL symbols in addition to the usual ASCII charecters. The disadvantege is that you cannot use IBM's high-resolution green monitor with IBM's APL, except when the output is free of APL symbols. In prectice, this meens that with IBM APL, you must use a color monitor or its equivalent for function definition end editing, rather than the ergonomically superior high-resolution mono displey. If eye comfort is important to you, or if you spend e great deal of time coding before the screen, the more expensive STSC system mey well be worth the difference in price on these grounds elone. Both systems allow for the use of dual displays, which, for certein applicetions, is very helpful.

Printing is fest and convenient on the IBM system, as the APL charcters ere bitmep printed, intermixed with normally printed ASCII cherecters et whet eppears to be e speed of 80 characters per second. This meens thet the ASCII characters in APL program listings can be emphasized, compressed, double-struck, or stretched. With APL*PLUS, this is possible only with normal ASCII output thet does not contein eny APL symbols. To print program listings with APL*PLUS, you have to go into Epson dot grephics mode, which is much slower, limited in its font options, end confined to an output formet of less then half e pege in width. The printed STSC APL symbols are, however, more attective.

The two APL keyboards are somewhat different. IBM's leyout is slightly more convenient for program development. But STSC's keyboard is far superior for deta entry, because STSC provides input wrep-around, e destructive backspece, type-aheed cepebility, and en exceptionelly thoughtful transformation of the long plus key into e second spacebar, which facilitetes repid one-handed deta entry when using the numeric keyped. For beginners, finding APL symbols on the keyboard is eesier with IBM APL's decels than it is with APL*PLUS's plastic reference card. Once you become competent with APL, however, neither is necessary—your fingers soon get to know where the symbols are loceted.

You cannot use IBM's high-resolution green monitor with IBM's APL, except when the output is free of APL symbols.

Editors

IBM's editing features are a genuine pleesure to use. The input editor operates on e full-screen basis. If you make a change in e line anywhere on the screen and press enter, the corrected line is displayed et the bottom and is eutomaticelly executed. This "echo" feeture cen be used either in immediete execution mode or during function definition. In eddition, IBM provides a speciel full-screen function editor especielly designed for entering and modifying programs. You can easily insert, copy, cancel, end even execute individuel lines of code. You also can cancel the entire editing session and retrieve your function es originelly defined. It elso is possible to execute something outside of the function, inspect the results, then immedietely continue where you left off with the editing task. While this editor is somewhet slow, its thoughtful design end its great convenience meke it an outstanding feeture of the IBM system.

A not-so-understanding feeture of IBM APL is its workspace management fecility. In eddition to its spece limitations discussed ebove, it has other problems. Copying of objects cen be done only from workspeces in transfer form, and the protect-

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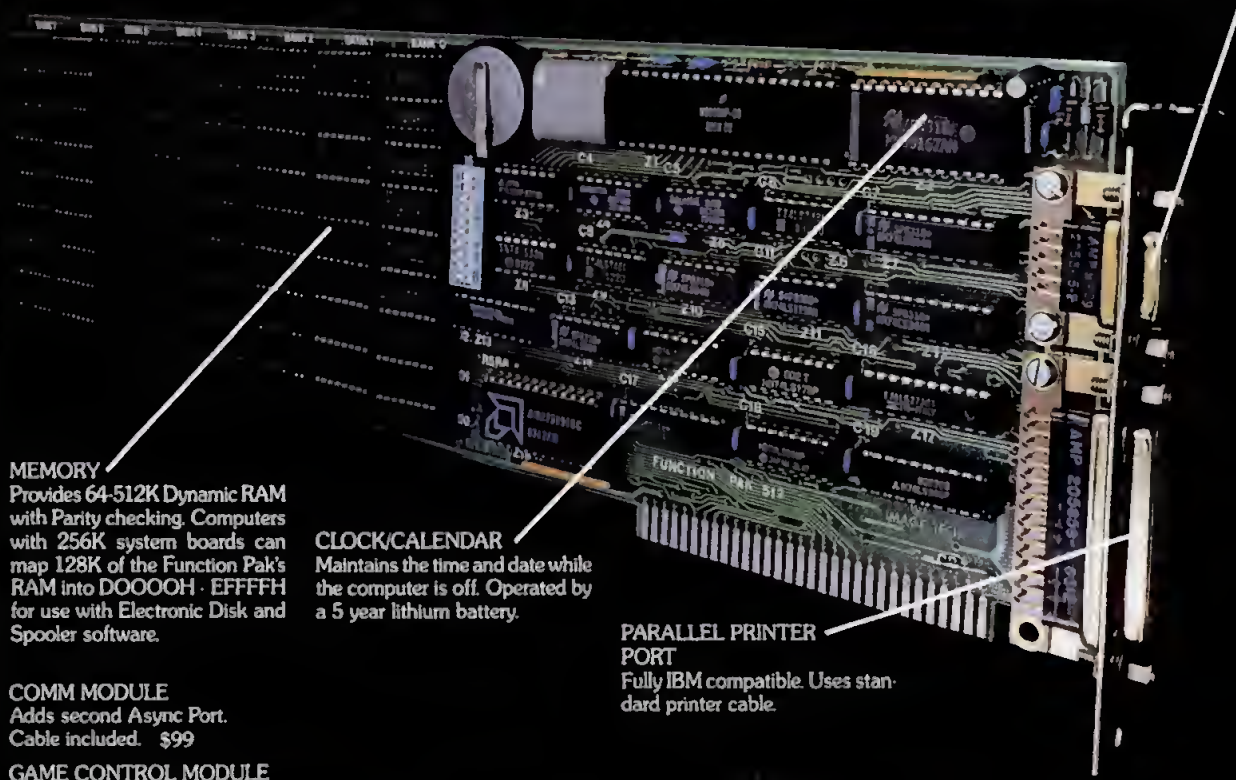

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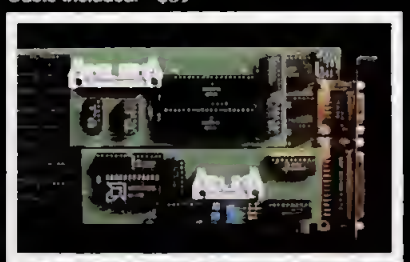

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Figure 1: Benchmark comparisons in APL.

Operation	APL Expression	Average Execution Time in Seconds		
		IBM APL APL*PLUS	With 8087	W/O 8087 APL*PLUS
No. of elements in V	Z←⍴V	.011	.033	.033
Sum of elements in V	Z←+/V	1.2	1.2	2.0
Adding pi to V	Z←V+PI	2.8	1.8	3.1
Subtracting pi from V	Z←V−PI	2.8	1.8	3.3
Mutliplying V by PI	Z←V×PI	2.6	1.8	3.7
Dividing V by pi	Z←V÷PI	2.7	1.8	8.2
Reciprocal of V	Z←÷V	1.2	1.2	3.6
Natural log of V	Z←⍟V	1.9	1.7	55.5
Square of V	Z←V*2	5.7	5.7	11.8
Square root of V	Z←V*0.5	4.9	3.8	30.5
Eighth root of V	Z←V*÷8	5.0	20.9	115.5
PI to the V power	Z←PI*V	5.0	19.4	108.1
e to the V power	Z←*V	2.4	17.0	52.0
Sine of V	Z←1○V	4.5	4.2	67.3
Cosine of V	Z←2○V	4.5	4.7	70.3
Tangent of V	Z←3○V	4.1	3.7	141.3
Sort V	Z←V[⍋V]	15.3	1.4	1.4
Alphabetize 2,500 pseudowords in array Q	Z←Q[ALPH⍋Q;]	57.8	5.1	5.1
10,000 empty loops	See comments	145	179	179

Most of the tests reported were done on e one-dimensional array (called a vector in APL) of 2,500 random integers from 1 to 100. This vector was created by V←?2500⍴100.

Starting at the right (as APL does), the symbol rho (⍴) generates 2,500 replications of the value 100. Then the symbol question mark (?) converts each of these into a random integer from one to the value of that vector element—in this case, always 100. The resulting vector of 2,500 random integers is then saved in the workspace as V.

Each operation listed (addition, subtraction, finding the square root) was performed on the entire set of 2,500 integers in vector V. The result, either a sum or more usually a

copy function, which in other APL implementations is a simple command, requires the use of a special function associated with the file-management system. The limitations of IBM APL's workspace management, and the awkwardness entailed in using it, are out of character in a language known for its simplicity and grace.

Once you get into the language however, the IBM implementation performs excellently. Benchmark results are given in Figure 1 for both the IBM and STSC packages. Neither implementation is generally superior. Each has its relative strengths and weaknesses. IBM is faster at determining the size of an array and is much better at exponential functions. IBM's APL, for example, can take a constant, raise it to 2,500 random powers from 1 to 100 and save the 2,500 resultant values as a named variable in the workspace—all in 5 seconds. For the special case constant e, it takes only 2–4 seconds. IBM APL's ability to perform the matrix divide operation, which is important in least-square curve-fitting, is spectacular. The implementation took only 4.1 seconds to solve 40 linear equations with 40 unknowns. This, incidentally, is accom-

SIMPLICITY does not mean that the computer is limited to doing simple tasks.

vector of 2,500 elements, was then assigned the name Z to become available as a stored object in the workspace.

The timing results given are averages based on a number of iterations of the full operation on V as described. The first operation (determining the number of elements in V) was iterated 1,000 times. Each of the other operations except the last was iterated ten times. Time taken by the iteration procedure itself was excluded from results which were cumulated and then averaged.

Two constants, the numberic PI and the character vector ALPH were predefined in the workspace. ALPH was created as:

```
ALPH←'ABCEDFGHIJKLMNOPQESTUVWXYZ'
```

To test the matrix divide operation, which uses the well-chosen domino symbol (⌹) in APL, i constructed a problem to solve 40 simultaneous linear equations. For this purpose, a 40-by-40 array C was created to represent the coefficient of the 40 linear equations. Random integers from 1 to 100 were used. The 40 constants, placed in a vector K, were random integers from 1 to 1,000.

The pseudoword sorting test was performed on a 2,500 row two-dimensional character array Q. Each row of Q consistad of six capital letters altarnating randomly selected consonants and vowels as in the pseudowords ZUVICO or XETEYE. The sorting was done according to the collating sequence defined in ALPH. At the conclusion of execution, the alphabetized character matrix was stored as object Z in the workspace. The timing results givan are averages based on 10 iterations of the sort.

It should be noted that all operations except the empty loops test are performed without looping. Furthermore, each can be done in immediate execution mode without the need for a program by directly using the APL expression given in the table. For the empty loops test, however, I used a program named PROB3 (see "Benchmark Programs," PC, Volume 2 Number 4):

```
 ∇PROB3;C
[1] C←⍬
[2] LOOP:→OUT×²10000<C←C+1
[3]    →Loop
[4] OUT:→⍬
[5] ∇
```

As there are 10,000 empty loops built into this APL program, it was run only once for timing purposes. The total number of seconds that it took to completa 10,000 empty loops is reported in the figure.

plished in APL with just five keystrokas (see F

PLUS is some- re com- trac- ng t- rt 4 c- 1 t t L

ences in sorting or looping speed. There are, however, substantial improvements with the 8087 for various floating-point operations and enormous gains when using exponantial, logarithmic, and trigonometric functions.

At $195, the IBM APL package is a bargain if you already have an 8087 installed in your PC. The implamentation will be especially appealing to programmers who need iBM APL's fast execution times for certain mathematical oparetions or who want to make use of the shared-variabie fecility to control external devices or to build auxiliary processors.

APL*PLUS, whila more expensive, is on the whole more comfortable to work with, especially if you have a monochroma monitor. In addition, its documentation is vastly superior. This, plus the tutorials and other support materiels supplied, make learning the languege with APL*PLUS much easier than with IBM APL. And, as pointed out earlier, the STSC implementation is certainly the product of choice for those working with large arrays or databases. Overall, IBM APL is more orientad toward the needs of the sciantific/technical community, while APL*PLUS is especially well designed to meet the needs of the business community.

APL IS concise, consistent, reasonable, and never arbitrary.

Looking et the benchmark comparisons, it is clear that many users would be quite satisfied with the respectable but nonoptimel performance of APL without the 8087. IBM, however, chose to maka superior performence mandatory by designing the peckage to require the co-processor. In doing so, IBM mey well have missed an important marketing opportunity: A lass than optimal APL package at $195 would be a super bargain, especially if eccompanied by decent documentation and tutorial materials. If such an offering existed, PC owners could have at their disposal what probably would be the world's most powerful dasktop calculator—all at e low cost, and requiring only e short learning period. And, if they wished, they could go on to laarn how to program In APL and hava a truly high-level language at their fingertips. These capebilities could, of course, be magnified leter on with the purchese of an 8087.

I hope that IBM choses to make e mass-use product in its next implementation of the language. Meanwhile, STSC is promising substantial enhancements in its new version of APL*PLUS: graphics; e full screen editor; an improvement in various execution times, including a speed-up of the matrix divide function by e fector of 8; session scrolling; the option of using kaywords insteed of APL symbols; the ability to execute DOS commands, including tha running of BASIC programs directly from within APL. */PC*

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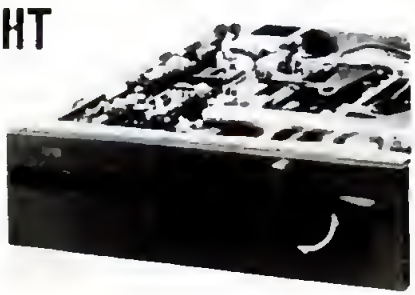

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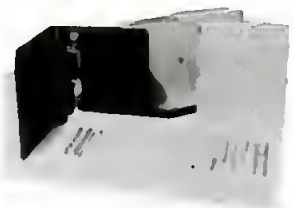

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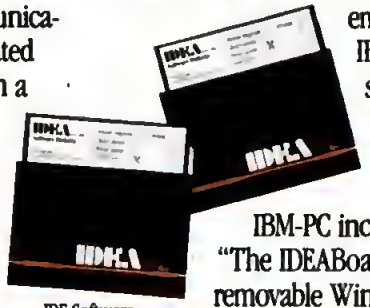

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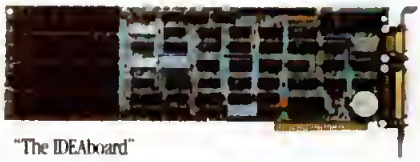

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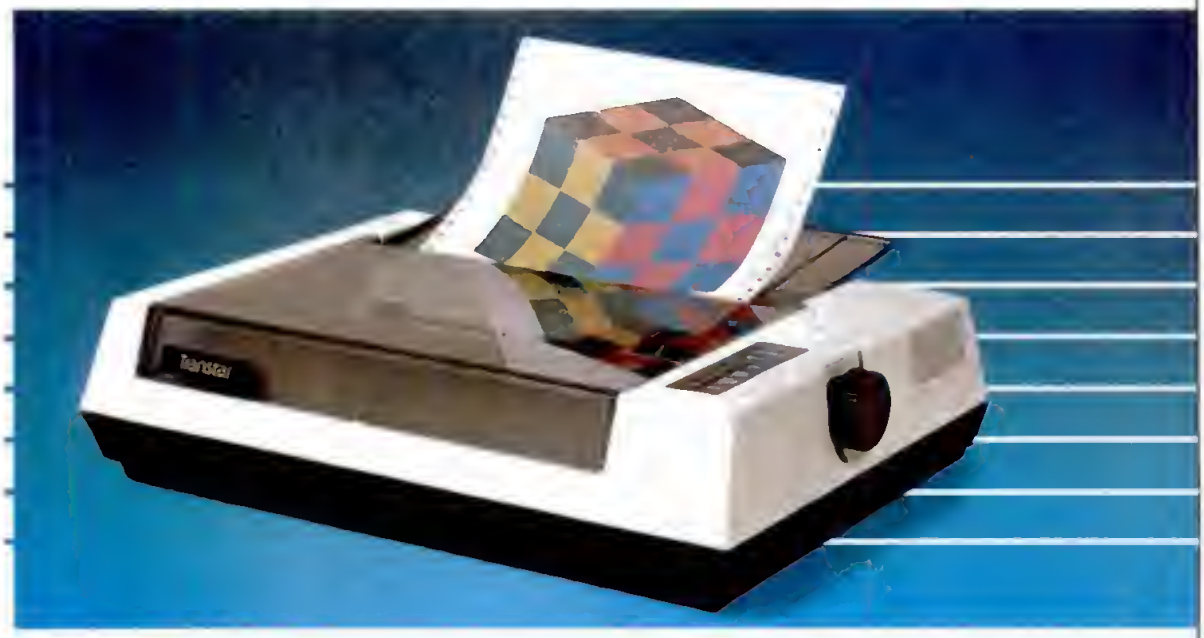

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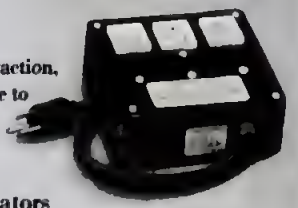

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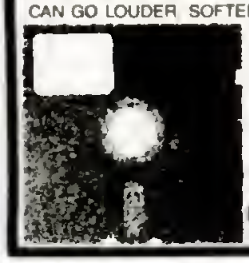

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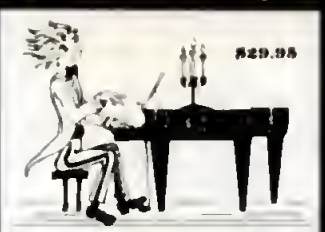

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APPLICATIONS/MICHAEL BANE

The PC, used with word processing and telecommunications, can speed up production, decrease the chance of error, and cut costs, making it possible to publish a small magazine.

Publishing With The PC

The magazine that appears on the newsstand and then in your hands may be the last step in a Buster Keaton car chase, the end of a frenetic race to beat the clock, the printer, the typesetter, the art director, the publisher, and a gaggle of writers who keep gumming up the works. The magazine editor is actually a traffic cop, routing small pieces of paper from and to a collection of loosely connected contractors, each with problems of his own.

A small foul-up at the beginning of the chain—perhaps a writer's typewriter self-destructs, or a photographer's camera runs out of film in Lower Cameroon—can trigger a chain reaction costing thousands of dollars and guaranteeing a new crop of gray hairs for the editor.

The Possible Dream

Having spent many years riding the vicissitudes of magazine publishing, my partner, Mary Ellen Moore, and I had an idea: Could a personal computer be used to publish a small magazine efficiently and cheaply? We received a proposition from a large insurance company in Tampa, Florida that was launching a publishing division. fts first project, at our suggestion, was a periodical guide, more than 100 pages of listings of restaurants, businesses, events, shops, and services for the use of visitors and local residents. With the 1984 Superbowl scheduled for Tampa, such a publication could be a potential gold mine, especially if firmly established. If we began work in September 1982, we were asked, coufd we have a magazine on the stands by the first week of the new year? Could we also do it on a low budget with minimaf overhead? The guide would be put out from home instead of from a traditionaf office, and it woufd use a personal computer as a link. As many operations as possible would be transferred to the computer, taking fulf advantage of the PC's capabillties.

A discussion with the head of the insurance company's computer operations supported our idea. Although the company had two mainframes, a number of word processors and magnetic card readers, and a pack of programmers at its disposal, the head of computer operations was quick to agree that for our purposes, a

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personal computer would be more efficient.

Disintermediation

In his book, The Next Economy, consultant Paul Hawkan describes a process he calls "disintermediation."

"I can walk from New York to Boston by myself," he writes. "To fly requires the work of tens of thousands of people. This is intermediation . . . I define disintermediation as the elimination of the middlemen and other intermediary people, processes, and functions."

The more intermediate steps built into any operation, the more complex that operation becomes. The more complex it becomes, the greater the specialization of the people involved. Hawken makes an eloquent case for the elimination of the middle people and believes the personal computer can play the central role in that process. Our goal, then, was to "disintermediate."

Consider a small magazine's production process—the basic routing of editorial material. At the beginning of the chain is the writer, who researches and writes the story, usually on a typewriter. The story is then mailed to an editor, who makes changes in the manuscript. This is often literally a cut-and-paste operation, and if the copy has become illegible, it must be retyped before being sent to the typesetter. If it's retyped in-house, it must be checked again for new errors.

At the typesetter's shop, the copy is retyped, this time into the typesetting computer. After the appropriate codes are entered, a proof, or galley, is printed out and sent back to the editor for proofreading and last minute changes. If corrections are substantial or if the typesetter's computer is having a particularly bad day, a second or even a third proof might be required before the story is considered "hard copy," pasted down and photographed for the printing plate. There's still one final proof—the film proof (also called "heat" proof)—before the presses run, one last chance to catch a cataclysmic error before it appears on the stands.

Each stage is supposed to be a sieve of increasingly finer mesh, winnowing out the mistakes. The system generally works well, except for one problem: Each time the copy is extensively edited or retyped, there's potential for mistakes to be edited in as well as out.

The traditional solution has been to hire more editors, more "eyes" to examine the copy, more proofreaders to examine the editor's editing. Of course, all these editors and proofreaders need desks and typewriters and assistants of their own. The office has to be expanded; the expanded office needs an office manager; the telephone service becomes inadequate. One morning the magazine wakes up and discovers that colossal overhead expenses have eaten up all the profits—a situation partly responsible for the deaths of a number of well-known magazines in recent years.

Having decided to publish the Bay Area Source, the name chosen for the guide, the need for disintermediation was clear. With an IBM PC, two 320K disk drives, and WordStar, Moore took responsibility for making editorial production efficient. "A personal computer is still like magic," she said. "So your mind is open to innovative things like decentralization and speeding up the copy flow, because the computer is nontraditional. Shuffling paper is traditional."

THE magazine editor is actually a traffic cop, routing small pieces of paper from and to a collection of loosely connected contractors.

The author and his partner Mary Ellen Moore using the PC to publish a periodical guide.

Data Decisions

I tackled the problem of the lists themselves. Most list-type publications are published by already existing magazines, usually city magazines with thousands of list entries already in their files. We had to start from scratch, and more importantly, we had to check the accuracy of the lists. We anticipated between 750 and 1,000 entries in the first edition, and we wanted as much flexibility as possible as to how those entries would be categorized. The magazine would cover not only Tampa but also the two dozen or so municipalities across Tampa Bay, including the cities of St. Petersburg and Clearwater.

The solution came after an afternoon sifting through computer programs with Vernon Barchard, a programmer moonlighting as a personal computer salesman. He suggested TIM III, a database management program by Innovative Software. We had a pretty good grip on word processing. (Moore had been involved with three different video editing systems at various newspapers and summed them up saying, "You've seen one command, you've seen them all.") But database management seemed to be one of those deep, dark computer mysteries, open only to the initiated.

Not so, Barchard insisted, and within the hour he set up a dummy database and sorted it in every conceivable way. Although not a true relational database like dBase II, TIM III is an extremely sophisticated file management system. It can contain up to 32,767 records, with each record consisting of a maximum of 40 fields. Each field can be as long as 60 characters.

Best of all, the program is completely menu-driven and easy to follow. The input screen is easily constructed and even easier to use. Sorting information and information on formatting are stored in libraries that you build yourself, making it easy to re-sort or print out reports.

Once the program was chosen, the first thing we did was define the database that would be the guts of the Bay Area Source. Using a yellow legal pad and stacks of other listing publications from around the country, we determined what data was important and useful and what was not. The major criterion was usefulness. When you plan to visit a shop or restaurant, what

do you want to know before you go?

That process was a long one but absolutely necessary when launching a small database management project. A database system is only as good as the people who put it together. It's better to err in favor of too much information rather than too little. Once we had our outline, we used *TIM III* to create the database structure on screen. From this point, Moore took over. While I was setting up the computer, she compiled a rough list of entries (usually just the name), drawn from personal experience, friends, advertisements, telephone books, and every other imaginable source. Once the structure of the database was complete, forms that duplicated the input screen were printed.

Since the Tampa Bay area is surrounded by colleges and universities, Moore had no trouble lining up students to fill in as temporary help. She also lined up a typist who had been trained not only on dedicated word processors but on a Radio Shack TRS-80 micro with Scripsit. The typist needed only minimal instruction to handle both *TIM III* and *WordStar*. As the temps finished filling out the forms and turned them in, the forms were added to the database.

"Because the bulk of the magazine consisted of lists, and the lists were going so smoothly, I was free to concentrate on the other important details," Moore said. "I was able to do much more in a shorter period of time, without an assistant."

EACH stage is supposed to be a sieve of increasingly finer mesh, winnowing out the mistakes.

Moore assigned the feature articles and the photographs while the database grew. Within 6 weeks, more than 10,000 pieces of information on the Tampa Bay area had been stored in the database. *TIM III*'s report and list function also allowed us to monitor the quality of the information being stored: Did we need to concentrate on a certain geographic area or a specific category; were each of the categories filling out as we'd anticipated; what would we do differently next time?

We also generated lists for the publisher's sales and marketing staff, keeping them informed on every step of the process.

The real test of the new database came when a skeptical friend dropped by one night. He had a date later in the evening. "If the machine is really so great," he said, "ask it where to could get margaritas cheap, not far from my house." The search took about 30 seconds and turned up two restaurants. He was impressed. "Congratulations," he said. "You've just invented the most expensive restaurant guide in the world."

Processing Words

Once the database was completed, the information was sorted into different files and transferred to *WordStar* with the simple *TIM III* utility; it asks what word processor you have, then creates the appropriate file type.

Moore began reformatting the files and changing the raw information into blocks of copy, which took less than a week. At this point she was in total control of the copy flow. The typist entered copy into the PC, but Moore was the only person permitted to make changes in that copy. As an addition to her own editing, we purchased *The Word Plus*, a program from

Telecommunicating

Transferring copy directly from a disk to the typesetter eliminates the need for keyboarding.

When Boldruler Typesetters of Tampa, Florida discovered the IBM PC, it was love at first sight. The PC is compatible with their typesetting equipment, making telecommunications possible.

Although co-owner Dan Dreyer had some experience with telecommunications, the operation had never run smoothly: "There were always small bugs that had to be worked out, especially with modems. Little things might screw up the whole transmission."

After working on *Bay Area Source*, Dreyer purchased his own personal computer, a PC-XT with 128K RAM and a hard disk drive. He promptly cabled the PC to his typesetting machine and solved most of the problems he'd had with customers' telecommunications.

Now the copy comes into the PC's hard disk, using the latest version of *PC-Talk*, instead of the typesetter's large floppies and unsophisticated communications program.

"It's so simple and much quicker," Dreyer said. "I have the ability to adjust my communications parameters to match what's coming in, and because of the hard disk, the transfer itself is faster."

More importantly, while his typesetting machine has super sophisticated search-and-replace functions, it can only implement them on the first pass, as the information comes into the machine.

"Sometimes there are commands built into the text that we don't expect," he said. "With the PC, we'd have to go back and remove them manually, one at a time. With the text on the PC's hard disk, we can juggle the typesetting program and run the text through again. It takes less time, which means it saves money."

The PC has allowed growth in Boldruler's telecommunicating business. "It probably represents 20 to 25 percent of our income," Dreyer said, "although only 5 percent of our clients use it."

The PC also handles billing and accounts, working from a custom program written in dBase II. Boldruler has also taken a few word processing jobs, making sure the PC earns its keep. Says Dreyer, "We tell our clients to allow the same amount of lead time, whether it's hard copy or telecommunicated. For people with a lot of copy, though, computers are the way to go." —M.B.

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Oasis Software, which corrects spelling errors. Moore was originelly skeptical but found that "the program worked ideally as a back-up to catch typographical errors." She added that the program really shines when faced with (ahem) e partner who could neither spell nor type accurately.

Moore used the program's word counter to celculate how much printed materiel would be in the magazine, en essentiel piece of informetion when it comes to laying out the magazine. We ran the word counter program of *The Word Plus* on e couple of peges of copy to get en accurate count, then had those peges typeset. By comparing the word count to the copy's typeset length in inches, we came up with an eccurate formule. So accurete, in fect, thet when the magazine wes pasted down, elmost no cutting was required.

IT'S BETTER to err in favor of too much information rather than too little.

Telephonic Typesetting

With the megazine edited, assembled, end stored in the PC, the next step wes telecommunicating to a typesetter. Boldruler Typesetters in Tempe had done good work for us before and was alreedy set up to eccept copy. Vice President end co-owner Dan Dreyer was fescinated by telecommunicating end interested in increesing his compeny's cepebilities in thet area.

It took a dey of tinkering to get the PC eligned with Boldruler's AM Internetionel typesetter. (The computer portion of the machine was mede by DEC.) The first thing we leerned was thet the *IBM Asynchronous Communicotions Support* softwere wes definitely not whet we needed. The solution came in the form of *PC-Tolk* from Freeware, e communications progrem thet did everything we needed et e great price—free. In fect, setting up the PC to communicete with his operation convinced Dreyer to buy e personal computer for his shop (see sidebar). Dreyer wrote e speciel progrem for the DEC that stripped *WordStar*'s control characters es the copy came in and reformetted it to his mechine's style.

Whet were the edventages of telecommuniceting? For one, e 40-percent reduction in price. "The most expensive thing e typesetter does," Dreyer said, "is to keyboard the copy into the machine." With telecommunicating thet step is unnecessery end its cost is seved. Secondly, there is no possibility of introducing new errors into the copy. The copy hed elreedy been through two proofreedings end had gone beck to Moore. The computer-to-typesetter copy chain ellowed her to keep complete control over the meteriel, resulting

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The Final Score

The editoriel eectione of Boy Areo Source were completed on time, and the magazine appeared in Jenuary 1983 es scheduled, selling 10,000 copies.

We kept well under budget and hed proved whet we had set out to prove: A small publication thet uses personal computers can be quicker, cheaper, and more efficient than its traditional, larger counterparts.

For an experienced editor like Moore, the personal computer provides the opportunity to work et home and still maintain the strict control necessary to keep a publicetion running smoothly. When not in use for editorial metters, her PC was constently churning out form letters seeking information, announcements of the publication, reports for sales and marketing, and updetes of the materiel in the detabase.

WHAT were the advantages of telecommunicating? For one, a 40-percent reduction in price.

The missing component in the eyetem is the human one. Running a publicetion tied together by the tenuous threads of telephones and computers might make e traditionel publisher more than a little nervous. And in our caee, it certainly did.

A long-range solution might be to heve a second or third PC ln the main office, with an office-bound manager who hes a direct link to the outlying troope vie electronic mail—e solution calling for en increaee in human input as well es the expension of a computer network.

There'e much to be said for the traditional office, with its undeniable sense of vitality. But with a world moving fester and faster, and with expenses increasing, there's much to be said for the bottom line as well. /PC

Michoel Bone is the outhor of six books, including Who's Who In Rock which is currently being converted into on on-line service of the Delphi dotobase. His mogozine orticles hove oppeared in Esquire, Signeture, Rolling Stone, The Village Voice, ond mony other publicotions. He owns on Osborne portoble computer and an IBM PC, ond soys he doesn't know how he lived without them.

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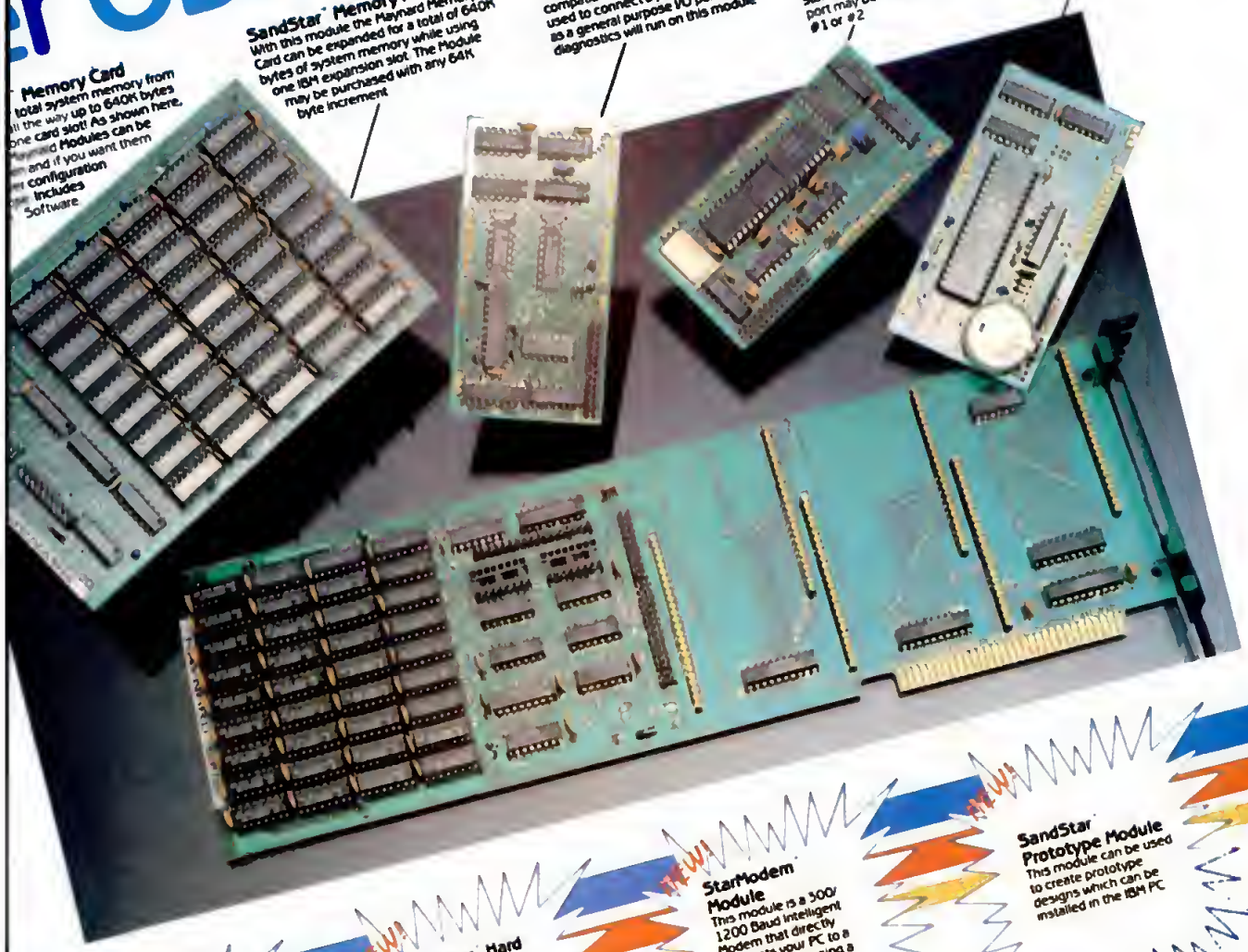

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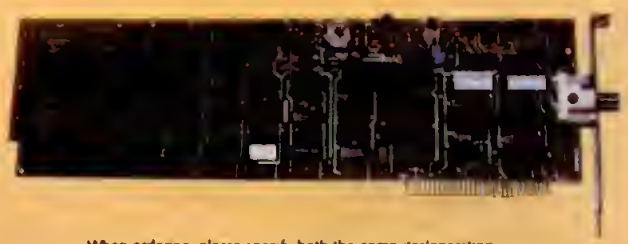

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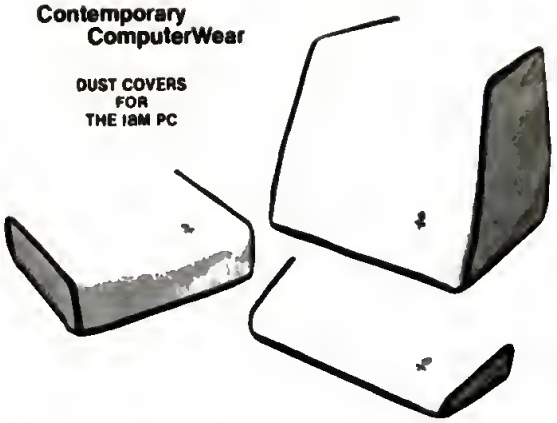

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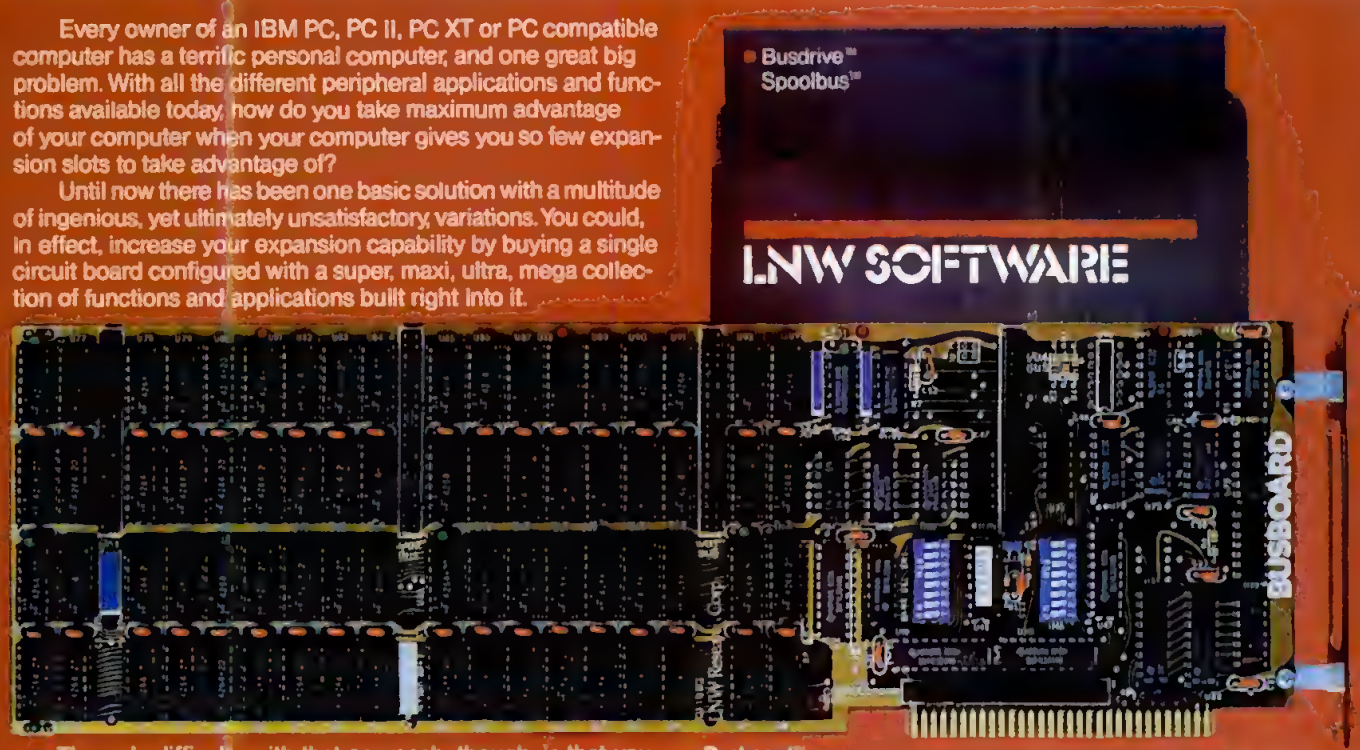

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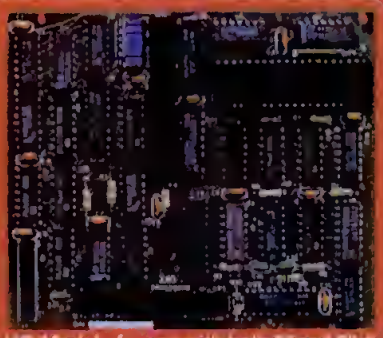

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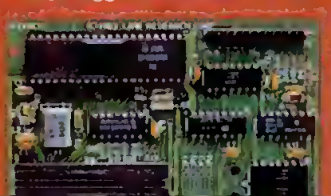

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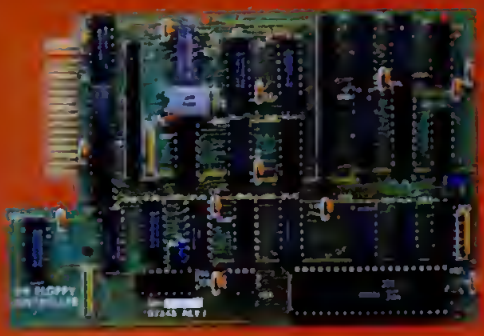

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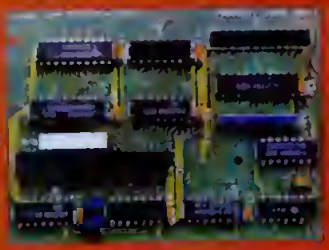

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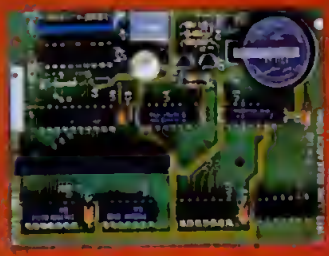

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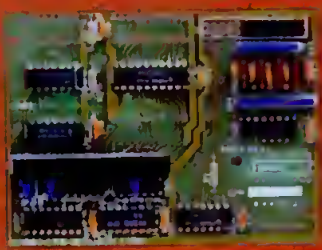

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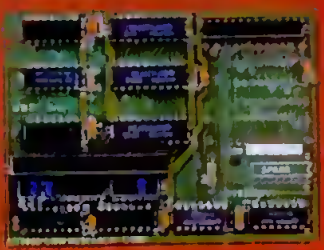

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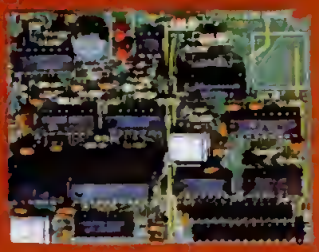

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A spelling checker and an on-line thesaurus might help some users, but they do little to speed the work of a professional writer.

Programs That Polish The Processed Word

When I imegine my idael word procassor, I rarely fantasiza about features no ona has invented yet. Instead I yearn to combine faatures of programs already on the markat: essentially, a WordStar clons with split screens, mail marga and multipla printout capability, sutomatic paragraph reslignment, on-screen underlina snd boldfaca, readily accassibla pre-set formats for different types of writing, and the ability to move instantly to a particular psge in s document without scrolling. An engine like thet would eesily fit under the hood of my 192K IBM PC right now if anyone cared to dasign it. Until someona perfects a megic button that will writa my articles for me, I expect my frustretions with word procassing software will hsvs more to do with flawad marketing thsn immature technology.

Spelling programs srs diffsrsnt. The technology to dalivar a really first-rate ona doesn't sxist, at laast not on tha msdium of s microcomputar floppy disk. Yas, I know that spelling checkers are elweys touted es the ultimete personsl computer luxury, along with balancing your chsckbook—in othar words, programs that relieva you of e boring job thet you mey be lousy at. That attituds is ths ssssntial problem with the genre, as far ss I'm concarnad. While VisiCalc and WordStar liberata users from pstty details, ellowing them to get e creative overview of their work, the users do have to supply ths brsinpower, without which the programs are just myler mush. Spelling programs, on the contrary, are billed as magic buttons—thay do it for you. I have no moral objections to such things if they do the job right; I was first on my block to buy a self-dsfrosting freezar. I slso own s few Gedget Freek's gaffes, like my battsry-operated, push-button papper mill thst grinds more slowly than ths manuel kind and numbs out your fingar in tha bargain. Similarly, most current magic-button software—the phone dielers end sppointment calendars, es well as ths spelling checkers—are more trouble thsn thsy're worth.

I speak as a parson who is a reasonable spalisr, someone who usually can tall when a word doesn't look quite right, evsn if I than havs to look up tha correct spalling. If you're ths kind of writar who unknowingly leaves multiple misspellings in your wake, you mey decide that, evsn within thair limitstions, spelling checkers are better than nothing. Just don't expect to click your heels together and throw your Webster's in the garbage.

Checking The Checkers

I recently ran an article through three pieces of spslling software: MicroPro's SpellStor (which only works with WordStor, in this case the nsw vsrsion 3.3); Oasis Systems' The *WORD Plus* (which runs with s variety of word processing

programs); and Peachtree's *Spelling Proofreader* (a component of the new *PeachText 5000* integrated software package; while it's designed to be used with the *PeachText Word Processor*, I was able to coax it into checking the spelling of my WordStor-processed article by affixing ".doc" at the end of the article's slug.) The article was a brief 993-word news report i'd done for a general circulation magazine on the status of microcomputers on the nation's campuses—its tone and vocabulary weren't especially technical or academic, however.

All the programs seemed to whir and grind at about the same pace and none

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Product Information

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MicroPro International Corp.
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San Rafaaf, CA 94903
(415) 499-1200
List Price: $250
Requires: 84K, two disk drives, 80-column monitor, WordStor 3.3.

CIRCLE 691 ON READER SERVICE CARD

The WORD PlusOasis Systems
3692 Midway Dr.
San Diego, CA 92110
(819) 222-1153
List Price: $150
Requires: 64K, one disk drive (two recommended). Default is set for use with *WordStor*, but program can be configured for use with most word processors running under MS-DOS and CP/M-86.

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PeachText 5000
Peachtree Software Inc.
3445 Peachtree Road N.E., 6th Floor
Atfanta, GA 30326
(800) 554-8900
List Price: $395 (includes *Spelling Proofreader*, Rondom House *Electronic Thesaurus*, PeachColc, and *List Monager*); *Spelling Proofreader* only, $150
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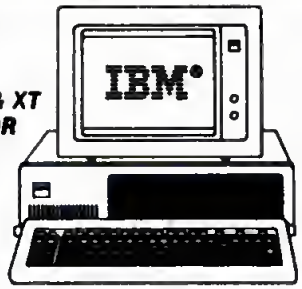

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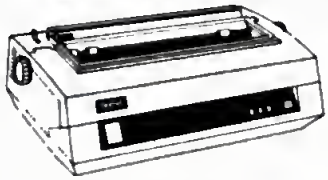

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seemed especially "user-hostile," although I wasn't crazy about SpellStar's single-spaced word-list print-out, done not in alphabetical order or in-text chronology, but shortest word first. All the

I WASN'T crazy about SpellStar's print-out, done shortest word first.

programs also boasted a few bells and/or whistles, some more useless than others. The near-universal insistence of spelling checkers on telling me how many "unique" words I've used in a document—i.e., the number of words I've used only once—is something I've never been able to fathom. I suspect this feature was designed by someone who thinks it's classier to expectorate than to spit.

On the other hand, word-counters, which are standard equipment with most spelling checkers, are truly helpful tools for writers. The one that comes with The *WORD* Plus can be disconnected from the spelling package and copied to your word processing disk for stand-alone use. The same program even boasts an anagram mode to help you cheat on the "Jumble" puzzle in the newspaper

Spelling? Well, all three correctly honed in on the two misspellings (actually, typos) in the article: "univesity" and "opprtunities." All three were also confounded by the perfectly correct "coursework," "digests," and "reassessed." In fact, all of them reported back scads of okay words—and the only mystery was why each reported different okay words.

PeachText found 78 "words mismatched"—its euphemistic acknowledgment of its imperfections, I suppose; if it had called them "misspellings," I would have been even grouchier. These included 31 proper nouns that one wouldn't expect its dictionary to contain (although it missed the proper noun "Susan"). The other words on the list included such brain-taxing jargon as "abstracts," "burgeoning," "coordinator," "dormitories," "freshmen," "graduating," "inaugurated," "interest-free," "leasing," "ma-

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jors," "obsolescent," "picketed," "professors," "scholarships," "spends," "supportive," "three-year," "unquestionebly," and "zenith." Note that I knew these words were correct and ignored the computer; if I were the kind of lousy speller wbo would most benefit from these programs, I would have hed to check the wbole llst in e non-electronic dictionary—that's a poor example of the computer's vaunted time-seving ability.

SpellStor did call them "misspelled words" and found 63. Along with PeochText, it threw up its hands at "campuses," "computerized" (!), "electronically," "exemplifies," "bumanities," "inundated," "seniors," and "updeting." It elso knitted its brow et "bytes," "stecks," "fitness," "ongoing," "totally," "suddenly," "netionelly," "traditionally," "workers'," and "today's," among others. (The astute reeder will notice thet SpellStor has e tendency to choke on suffixes.)

The WORD Plus ceme in more respectably with only 49 "unmetched words," but among them were "thus," "explains," "printers," "terminals," and "hands-on." If you catch a certain technophobic drift here, let me edd thet both it end SpellStor blew "microcomputers"; both it and PeochText elso passed on "non-technical." *The WORD Plus* elso easily helps you look up on line words thet are similar to your misspelled one. But the program bed e few peculiarities, such as the inability to note correctly spelled common geogrepbical names. Both of the other checkers knew how to spell "Wisconsin," "Georgie," end "Indiene," which *The WORD Plus* didn't, although all three drew a blank on the abbrevietion for Connecticut. And while *The WORD Plus* seemed more elegantly designed and far outshone its rivals in not stumbling over possessives and plurals, it hed a distinct Phobie ebout hyphenated words, even when it understood both helves.

Not surprisingly, the progrems' dictionary sizes are in inverse proportion to the sizes of their lists of supposedly misspelled words. PeochText, which found the most, weighs in at ebout 55K; SpellStar is 97K; *The WORD Plus* is e comparatiely chunky 105K. (The figures are for the dictionaries alone, not the accompanying progrems that power them.) For systems with single-sided drives, or for a user who wants to put e spelling program on e double-sided drive with the word processing software, including e little room to add words to the dictionary, a program vastly larger then *The WORD Plus* doesn't look technologically promising. This means that, for the time belng, you'll be getting lists of e lot of correctly spelled words, no matter what.

SOME OF THE words the checkers muffed were computer-specific terms.

Some of the words the checkers muffed were admittedly computer-specific terms, and I suppose if I added them to the dictionaries, the lists of misspellings on any future computer-reieted articles I might write would be shorter. The trouble is that like many writers (and students, and others who use word processing), I cover e variety of topics in my work. In the past few months, I've done articles ranging from New York City erchitectural preservation, to enorexie nervosa, to people who meet their lovers through the classified eds—each with its own unique (although hardly arcane) vocabulary. Adding words to precious dictionary space might not mean much under the circumstances. (And since the point of a speiiing checker is to "do it for you," I confess that ell that bookkeeping elso seems like e pain in the DOS.)

But even if I bad en on-line dictionary as fat as the one on my shelf, I still wouldn't be satisfied. Ob, I'd probably use it to locete typos—but then I'd start to get angry at ell the things it wouldn't do (i.e. catch my failures to remember to press Ctrl-B and elign my paragraphs, note all my infernal bugaboos of the "To be or not to to be" veriety, make sure I've turned off my underline commands wben I'm supposed to, and so on). Spelling is only one of e number of things I can—and do—

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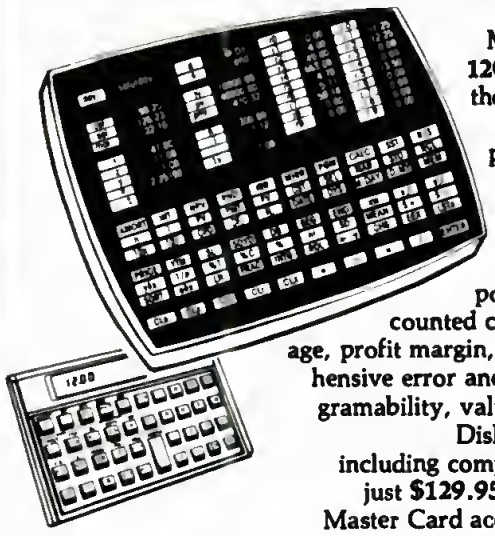

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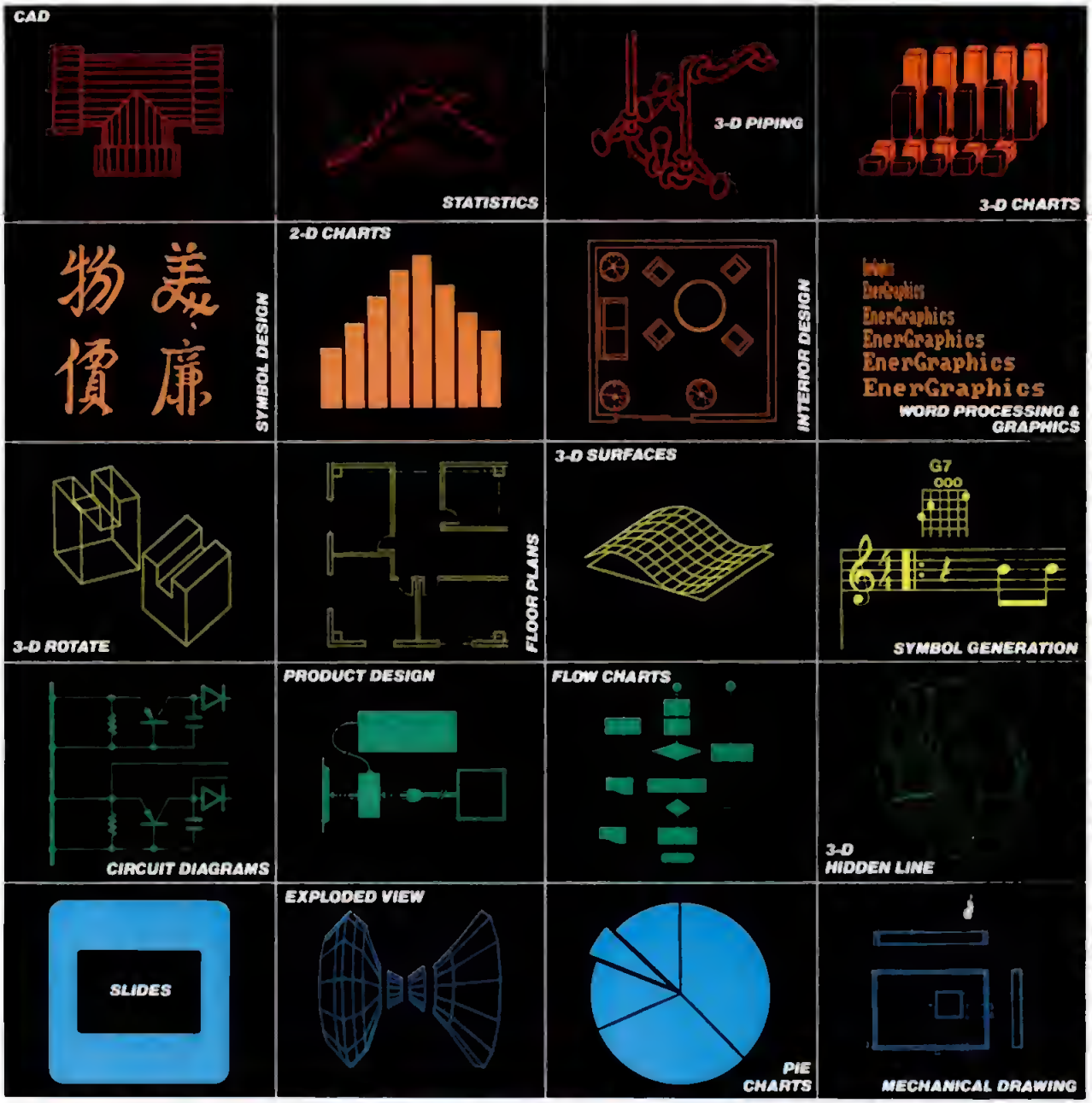

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screw up whan I write, so e program that only catches spelling errors doesn't save me much tima. I alweys end up having to line-proofreed my copy anywey. While I'm there, it doasn't saam like a big deal to look up tha occaslonal spelling I'm not sure of.

An Electronic Thesaurus

Howavar, I hava to admit that I had some fun playing around with one of the modules of tha *PeochText 5000* program: tha Rondom House Electronic Thesourus. The program is extremely simple to use; you just put your cursor at the beginnIng of e word and press F10. A list of synonyms will appear at the bottom of your screen. (If tha word you're seeking isn't in the Thesourus, you'll get a messaga talling you which two words in tha Thesourus are elphebetically closest to your word.) To replace your word with a *Thesaurus* word, you press the right-arrow cursor key until you land on the word you went; then press Return for automatic insertion into your text.

I fad in tha classic Rhett Butler line, "Frankly, my dear, I don't give e damn," to see what tha Thesourus could coma up with. First, I got tha massage: "FRANKLY not in thasaurus [cq]. Found FRANK and FRAUD." Keying in "frenk" next, I got the listing:

I FED IN THE classic Rhett Butler line, "Frankly, my dear, I don't give a damn," to see what the Thesaurus could come up with.

```
[Frank]- (adj.) opan, candid, free, truthful, uninhibited, ingenuous, outright.
```

Not surprisingly, there was no listing for "my" (or for "I" or "don't" or most other smallish words I tried), but for "daar" I drew a slew of synonyms: beloved, loved, dorling, esteemed, and high-priced. Ditto for "give": deliver, import, provide, supply, donote, occommodote with, turn over, ossign, show, present, offer, ossume, offord, perform, communicote. For "damn," ales, I got anothar no-show: "DAMN not in thesaurus. Found DAMAGE and DAMP."

The Dictionary Dealer

Tha man behind the *Thesaurus* is 32-year-old Dick Brass, until recently president of Dictronics Publishing Inc., a firm that early on acquired the electronic rights to virtually every reference book in the businass. As It happens, Brass was e colleague of mine a number of years ego et the *New York Post*. I remamber him as someone who was less than beloved by the other reporters on tha staff, mainly because ha gave out the distinct impression that he was too good for the newspapar businass. He was right. Earlier this summer, Brass sold Dictronics to Wang, becomIng a Wang executive and a multi-millionaire in tha procass.

ONE COULD take all the books one keeps next to the typewriter and use them electronically.

Like many people, Brass "just kind of stumblad into the software businass." Working es e food critic, Brass got en assignmant to write a book about the fevorIte resteurants of some 1,000 other food critics across the country. "Since thare's just so much ona can do with indax cerds," Brass recalls, "I bought a computer—e NorthStar Horizon." Ha also bought en early spelling program that "had such e lousy dictionary that misspell was misspelled." Bress realized thet putting a brend-name dictionary on line, as opposed to soma programmer's word list, would meke all tha differenca In the world. "And then I realized, in a moment of near-rellgious apiphany, that one could take all the books one keeps next to the typewriter and use tham electronically."

The most remarkabla aspect of Bress's idea, he says now, is that no one hed thought of it before—end the publlshers of the rafarance books themselves dIdn't hava a clue thet they were sitting on a sil-

icon-mine. Brass was able to buy up rights—cheap—to such works as Roget's *Thesaurus*, *Block's Law Dictionary*, *Stedman's Medical Dictionary*, *The McGraw-Hill Dictionary of Scientific and Technical Terms*, *The Chicago Manual of Style*, *The Oxford Dictionary of Quotations*, and *The Random House Dictionary*, among others. Software companies could use the reference works through licensing agreements with Dictronics (now, through Wang Electronic Publishing). In fact, according to Bress, a WordStor version of the Random House Electronic Thesaurus for the PC is due on the market this fall.

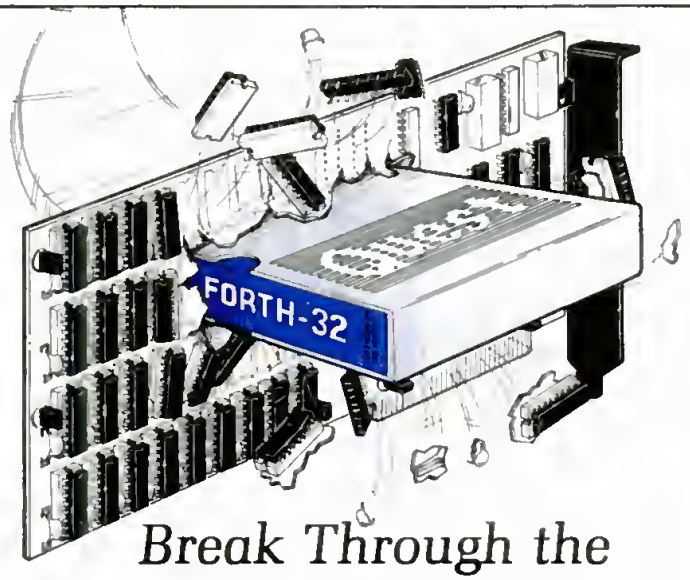
After acquiring the rights, Dictronics developed an algorithm that, according to Brass, "allows us to compress words more tightly than anyone else." The company then made an arrangement with a large, multinational company (he won't say which one) to monitor its total output of word processing: letters, memos, and reports. "We never read their mail," said Brass. "We just monitored the words that were used, and we counted them. It was a terrific opportunity, because we were really able to tap the business world like a maple tree." The project yielded the information that about 7,000 words cover some 98 percent of the typical business vocabulary. Dictronics designed its programs so that those words would reside in RAM in its dictionaries, with less-utilized words relegated to disk access.

ABOUT 7,000 words cover some 98 percent of the typical business vocabulary.

Future References

In the works right now, Brass added, is a grammar checker, which will catch split infinitives and measure things such as how often you use the passive voice, and—piece de resistance—chart out for you how smart a reader has to be to understand your writing, on a scale from third-grader to Ph.D. "For instance, if you were writing advertising copy," Bress noted, "you wouldn't want to aim too high." Another on-the-horizon product, Letter Pak, holds models of more than 100,000 different business letters in 15 categories. "For instance, if you wanted to send a dunning letter, you'd call up the category of Demand For Payment," Bress explained. "Then you'd have a range of choices from, say, a first request to a valued customer, on down to your last warning to a flagrant deadbeat about what you're going to do to his knees by what date if he doesn't pay up. All you do is key in a few specifics. It only takes about 15 seconds to generate a letter."

Bress's emphasis on the business world is unquestionably a savvy one, but



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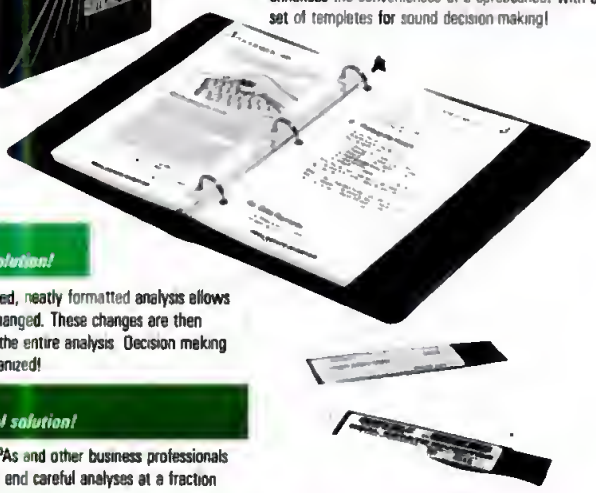

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it also expleined to me why, after several hours of heppily fooling around with *PeachText's Thesourus*, I realized that I probably would never use it—end neither would most other professional writers.

SOMETIMES, IF I can't get the synonym I want my brain gets jogged by the antonym entry.

The reeson is thet in real life, I almost never grab for my thesaurus to look up e common word. Whet usually heppens is that I get an obscure word caught in my brain—often as part of a cliche, like "callow youth" or "meteoric rise"—and I can't get rid of it. Neither collow nor meteoric are in the *Rondom House Electronic Thesourus*—nor are very many other unusual words. (To be feir, such words don't eppear in the non-electronic, elphabetically-arranged, pocket thesauruses thet one can buy—which is why I own a fat, herdbound, old-fashioned *Roget's*.) I also miss the freedom thet comes with looking et all the entries on the subject-arrenged peges of my *Roget's*. Sometimes, if I can't get the synonym I want from the synonym entry, my brain gets jogged by the antonym entry, or by e conceptuelly releted entry.

When I mentioned these misgivings to Brass, he heartily concurred, and even hed the enswer: e scrollable electronic version of *Roget's*. The problem, he edded, is that while the uncompressed *Rondom House Thesourus* is only e few hundred K, *Roget's* weighs in et better than two megebytes. "In the future," Brass confidently predicted, "professional writers will invest in hard disks and think it's well worth it to tie up 20 percent of their storege space on *Roget's*." Sounds swell, and as soon as the price of the XT goes down, I'll be sure to snep one up. Meenwhile, I think I'll seve $5,000 and keep my enelog *Roget's* near the computer.

Do I think the electronic theseurus is here to stey? Candidly, my beloved, I don't impart e ****. */PC*

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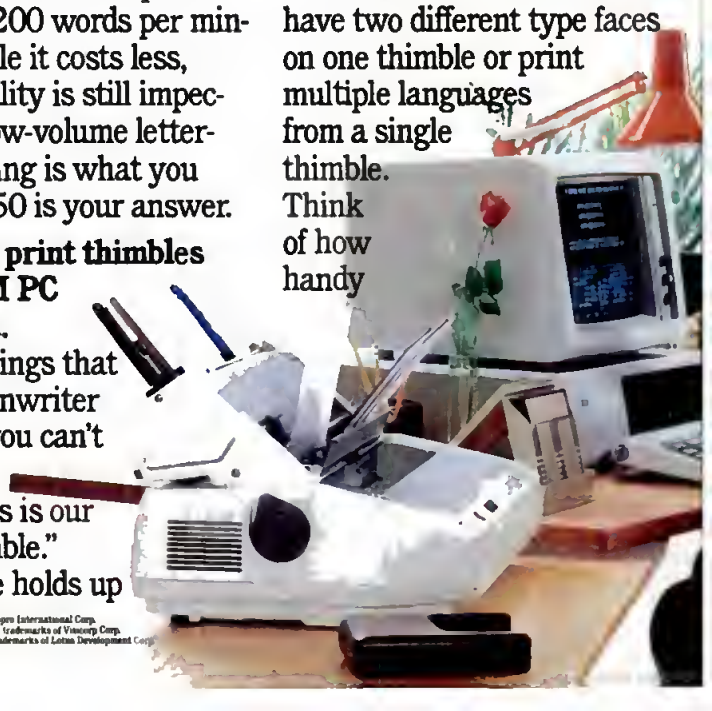

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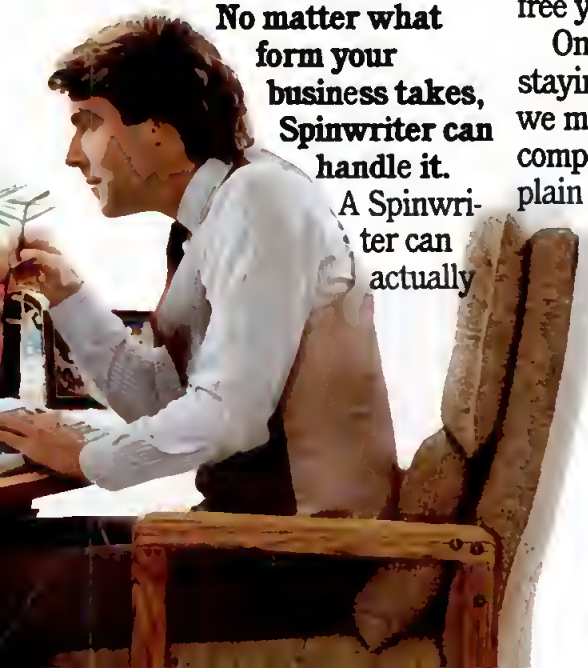

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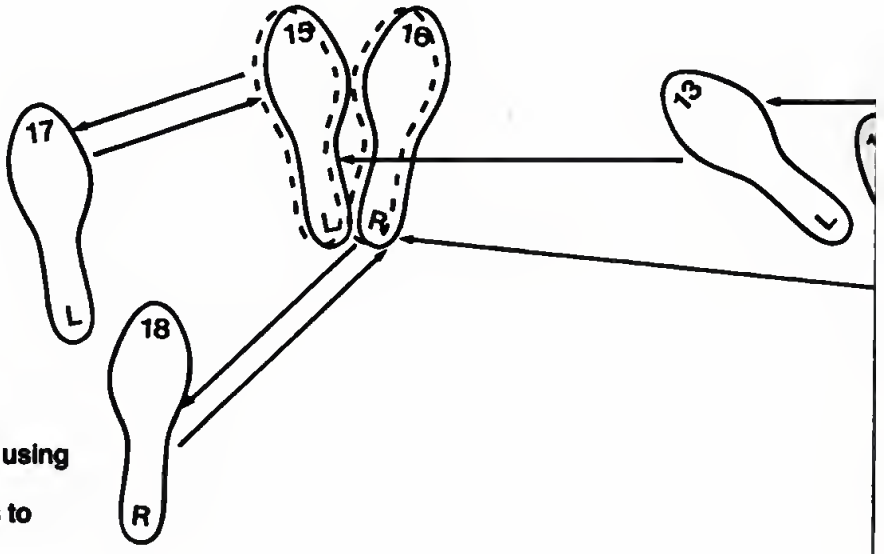

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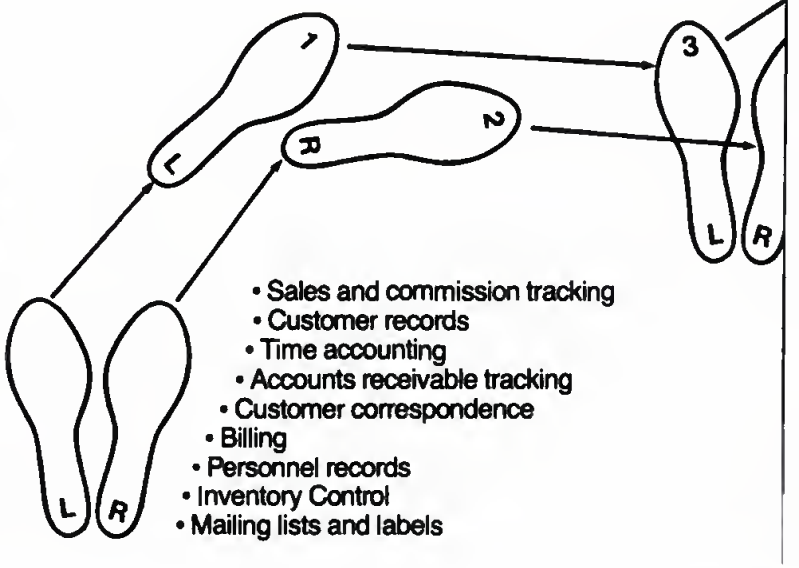

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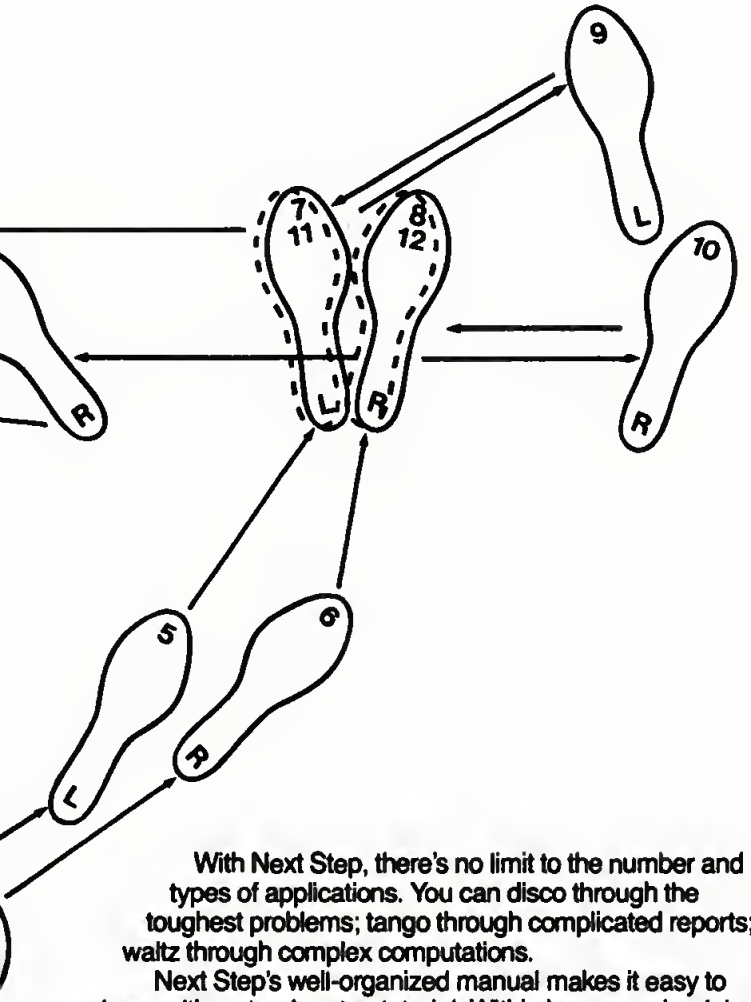

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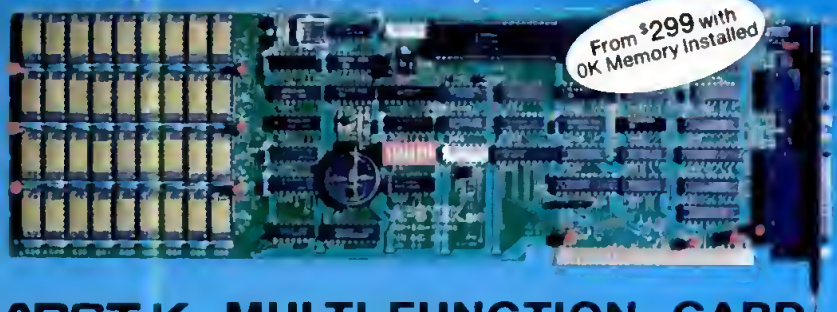

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SOFTWARE/DIAN CRAYNE

In this flexible if somewhat plodding program, which comes from across the sea if not from out of this world, numbers are locked into the spreadsheet once it has been entered.

MARS: Beyond Spreadsheets

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Requires: 48K, dual disk drives.

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The Martians are coming, and financial modeling may never be the same! Sopphire *MARS*, designed by Sapphire Systems of the United Kingdom, is now available in the United States. *MARS*, which stands for Management Accounting Reporting System, has been on the market over there for 2 years and is presently being used by over 4,000 microcomputer owners.

MARS takes a whole new approach to producing reports. In the usual spreadsheet approach, the user types data and formulas into blank matrix "cells" to create a report. *MARS* allows you to create and store a report matrix and the calculations that go with it. Unlike spreadsheet reports, the *MARS* reports do not inextricably tie up the data with the report format.

When the time comes to run a *MARS* report, you can type in the data, or tell *MARS* to extract it from a stored file (such as a *General Ledger* update). You can even produce a report that uses typed data, extracted data, and data copied from another *MARS* report.

Completed *MARS* reports, stored on disk, can be pushed around with a word processor and bullied into any format you like. What's more, since the files are word processor-compatible, you can print an entire document, including embedded *MARS* reports, all at one time.

MARS scores another point with its menu approach to financial modeling. All of its functions are selected through simple menu displays that lead you logically through the report-building process. It's simple, easy to understand, and frees you from having to memorize commands or refer to a manual.

What do you have to sacrifice for all this? Immediacy, for the most part. Since the report matrix is built separately from the report, you can't just add a row of first quarter figures and watch the changed values ripple across into the last quarter. You don't get the rapid feedback associated with a spreadsheet.

MARS needs at least 48K to get a good grip on life. The entire report matrix is held in memory at one time, so the more memory you have, the larger report you can turn out. The distributors claim 64K will hold 6,000 cells of data and 600 lines of calculations comfortably. They also say that reports with 67 columns and 165 rows have been run with no problems.

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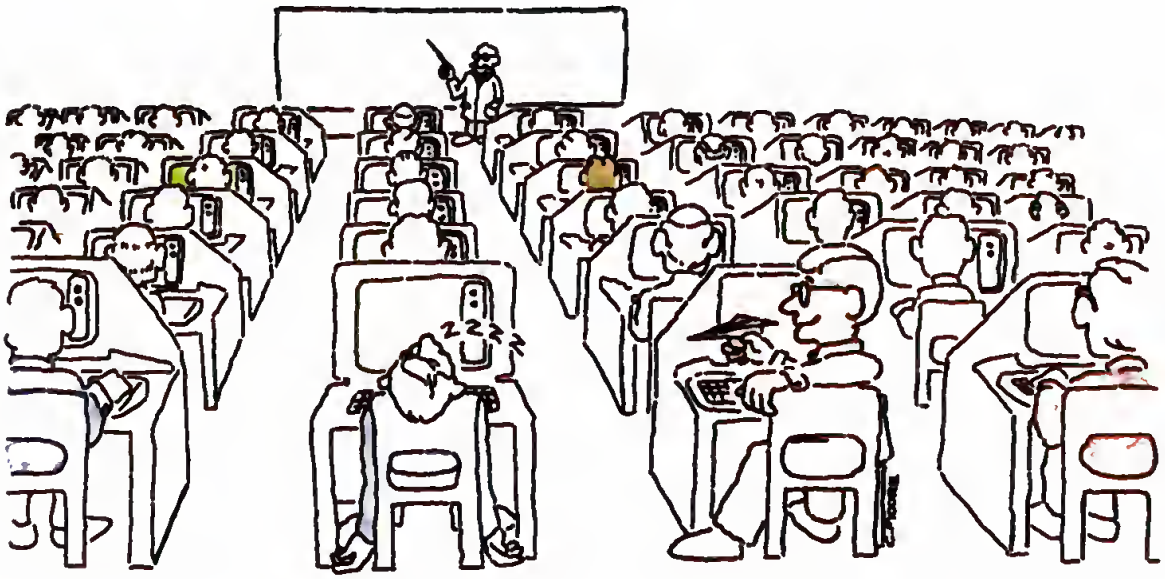

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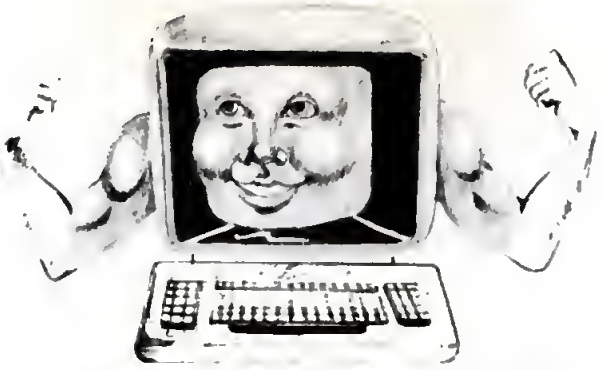

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First Steps

I worked for about 4 days with demo Version 2.14 of *MARS*. There were a few minor problems, which presumably don't exist in the standard release. The stored examples in my copy of the software did not match the examples shown in the tutorial, and the backup features were not included, so I couldn't test backup retrieval and protection.

As a test case, I decided to build a simple inventory report that listed part numbers with quantities, unit cost, unit value, and cost and value extensions. This is the sort of report a warehouse manager might prepare for the financiel vice president, showing the amount of money tied up in current inventory.

The first thing I did wes spend ebout 2 bours going through the *MARS* tutorial and getting used to the basic functions. The tutorial gives a good step-by-step description of setting up a report, and, with few exceptions, the menu screens are logical, easy to find, and easy to use.

THE STORED examples in my copy of the software did not match the examples shown in the tutorial.

The main menu screen for *MARS* offers five choices. You can run a job, create or edit e job, use a spreadsheet, change the report date, or do maintenance. (Maintenance is mostly concerned with retrieving backup files.) Pressing Esc causes *MARS* to abdicate end sends you back to the system. If you press Esc et any other display, it takes you back to the previous screen. This is a nice feature. If you get lost in the menu tree, all you have to do is Escape back to familiar territory.

Another hendy fecet of *MARS* display is the elapsed time indicator at the bottom of each screen. It gives you en hours:minutes:seconds display of just how long you've been working during the current session.

When you create e new job, you have to fill in the blanks on a Job Description screen. This screen sets up the report name and lets you enter a brief description of it (see Figure 1). It gives you an opportunity to specify the number of columns and rows, the length of titles, and the default print format. (Print formet can also be selected on a row-by-row basis.) You cen choose e page size of 64 by 80, or 64 by 132, to match your printer.

MARS allows column headings only across the top and titles along the left edge. You can't put alpha or alphanumeric labels into the metrix cells. This means that *MARS* could not be used for, say, an inventory report listing parts and their alphanumeric bin locations. However, you can enter extra headings between the row titles, allowing you to specify subgroupings.

Before you stert to fill out the job description or go any further into defining the report, it's a good idea to make e sketch of what you went. The *MARS* manual says, quite frankly, "Work out on paper exactly what you want the final product to look like—the shape of the report and the headings you ere going to use." While this might seem redundant to people used to VisiColc, it does mean that a report can be sketched out ehead of time with the necessary calculations, and then turned over to a member of the clerical staff for actual input.

After the matrix size has been set and the job description specified, you can go on to entering the row and column titles and defining the pege layout. The leyout screen handles the report headings and lets you add blenk lines for the sake of format (see Figure 2). I hed a little trouble with this screen. The backspace key is used to rub out characters, but its response is slow, and when I got impatient and jiggled the key, I wetched my title characters march to their extinction in the proverbial black hole. *MARS* uses Ctrl-J to skip to each new input field on the screen. On the occasions that I forgot and tried to use the right arrow, the drives came to life briefly, the screen cleered, displayed the message ERROR IN CALC, end bounced me back to the previous screen.

Adding Calculations

Once the report leyout has been fully described, it's time to add the calculations. Calculations are entered vie a separate screen with numbered command lines. The formet is eesy to understand, and quite straightforward (see Figure 3). *MARS* has the four basic arithmetic functions, plus Move, Clear, and Percent commands. It also includes some nice financiel commands, such as NPV, which calculates net present value of future cash flow, and PAYB, which calculates when an initial investment will be paid back.

There is en IF/THEN commend set, so you can build simple loops, and a Round feature for specifying eccuracy. You can add two rows together and have the results displayed in a third row; you can subtrect one row from another; and you can spread a growth rate across a number of rows.

The calculations screen was another one that gave me e little trouble. *MARS* displeys the blank form first, and then fetches any previous input from memory. It doesn't exactly set e new indoor record

Figure 1: The Job Description screen sets up the name, o brief description of the job, ond ollows you to define row, title, and page size specifications.

```
SAPPHIRE MARS Job Editor      Serial No: ME001005              by Sapphire Systems
-------------------------------------------------------------------------------

                    Editing Report Page Layout for COST
                    -----------------------------------

 Lines    Line Types          Text Contents                          Position
 ---------------------------------------------------------------------------

 2        Heading line        Acme warehouses Inc.                   1
 3        Heading line        QUARTERLY INVENTORY REPORT             2
                                                                    following
                                                                    following
                                                                    following
                                                                    following
 4 - 5    Row lines           Row titles                             1



     Use SPACE, BACKSPACE or CTRL-J to move the cursor, press I to insert,
 D to Delete characters, RETURN to edit the printing positions or ESC to exit

              3U=00302/10/82300:06:553
```

for doing this. I kept trying to type on the blank form, and noticed that my data was overlaid when *MARS* finally finished the display. If you change an existing line

THE SAME report matrix can be used again and again with different data files.

there is a long pregnant pause while *MARS* evaluates it and refreshes the screen.

Besides using the *MARS* commands, you can write your own processing code with CBASIC and include it in the report. This is done by setting up a "common" block that contains variables for the page size and layout parameters, inserting your CBASIC code, and then finishing off with a CHAIN "CALC" command. This gives you the ability to do just about anything with the report data that you're capable of coding.

Other Features

After the report has been completely described, including all calculations, it is stored under a job name and can be retrieved for later use. The Job Description screen has a line that is used to specify whether the job is fully or partially defined. There is no security control on this setting. A job that is already fully defined can be changed without any error or warning messages appearing. However, a job that is partially defined can't be used to run a report. It doesn't show up on the Run screen.

The Run function retrieves the report matrix and prompts for data to fill it. All data that is keyed in is stored in a separate data file rather than in the matrix. This means that the same report matrix can be used again and again with different data files. Or, conversely, you can run several different reports against the same data without having to retype it. All you have to do is build different report matrixes.

MARS has to have an input file for the report data. Even if the information is keyed in, a file name has to be specified. I absent-mindedly erased the name of the demo data file from the report "source file" screen, and found my report filled with zeros—despite the fact that the keyed data was still available for change on the input screens.

Data that is retrieved from a stored data file is accessed by key. *MARS* has a menu display for entry of record size, key field position, and key field size. The data fields within this key-selected record are then specified according to their position within the record and their size. After this is done, all you have to do is tell *MARS* what column or columns to write the information in.

Using this key feature would allow a user to build a financial report for Accounts Receivable, for example, keyed on account number and displaying days delinquent and current interest charges.

One of the options in the Run menu set, selection 5, lets you request a complete run, with all file input, calculations, and printing. If you don't need to rerun the entire job, you can run through the calculations separately or merely print the report. If you do select option 5, there doesn't appear to be any way to interrupt it short of rebooting. *MARS* does not honor the Esc request until it has started up the printer, regardless of what the screen says. I found this a little unnerving, as I frantically tried to Escape from some unwanted processing.

If you are really familiar with *MARS* and impatient with the menu displays, a set of "expert" commands allows you to go directly to the input screens without viewing the intervening selection displays. This is called the View option. It

Figure 2: Row and column titles and page layout definitions are entered on the Report Page Layout screen.

```
SAPPHIRE MARS Job Editor     Serial No: ME001085              by Sapphire Systems
-------------------------------------------------------------------------------

                              Job Description
                              ---------------

                           Job name:    COST

        Description: cost of inventory        Status: Fully defined

                  The columns are printed at 6  per page.

              The row descriptions are up to 10 characters long

                The column titles are up to 12 characters long.

                  The default picture for amounts is ######

                The page size is 64 in length by 80  in width.


        Press CTRL-J or BACKSPACE to move the cursor, or ESC to exit
            3U=00302/10/82300:17:343
```

Figure 3: Calculations are entered in a separate screen with numbered command lines.

```
SAPPHIRE MARS Job Editor     Serial No: ME001085              by Sapphire Systems
-------------------------------------------------------------------------------

                  Editing Calculations Commands for COST
                  --------------------------------------


              No.        Command Line
              ----------------------
              1       MULT C1,1-11 BY C2,1-11 GIVING C3,1-11
              2       MULT C1,1-11 BY C4,1-11 GIVING C5,1-11
              3       TOT R1-R11,1 GIVING R12
              4       TOT R1-R11,3 GIVING R12
              5       TOT R1-R11,5 GIVING R12
              6       SAV
              7
              8
              9
              10


            Type I to insert a command, E to Erase a command
              Enter CTRL-J or BACKSPACE to move the cursor
        Enter RETURN for the next screen or ESC to Exit and Save
            3U=00302/10/82300:02:393
```

has a series of easily remembered commands, such as MATSET and makes input a lot faster. For some reason, the View option affects the screen refresh when the report is being executed and tends to slow up the calculations. The people at Capital Systems Group suggest that you type VIEW OFF to disable the option when you're ready to execute the report.

MARS does have a spreadsheet option that can be selected from the main menu. It's intended as a scratchpad area, and there isn't much information in the manual on using it. The spreadsheet is not programmable and is not based on any MARS job. It is just available for the user's convenience in testing calculations before running them against an entire data file. There is no direct cursor control to the spreadsheet, and the only way to enter numbers is to use the MARS calculation commands. The next release of MARS (due out during the last quarter of this year) is scheduled to include full spreadsheet capabilities with all of the split-screen and fancy-cursor functions.

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CIRCLE 217 ON READER SERVICE CARD

WHEN I got impatient and jiggled the key, I watched my title characters march to their extinction in the proverbial black hole.

Recap

The main weakness of MARS is in report maintenance. If you want to add or delete a row or column, you have to go back to the matrix level and redefine the layout. Since you can't split the screen to look at both ends of the matrix, there is no way to do immediate forecasting by changing the first month figures and seeing changes right away in the twelfth month cells. If you want to change a calculation, there is no way of doing it on the fly, as you can with spreadsheets.

MARS is not designed for the middle manager who needs to whip up a fast financial report for the Board. It needs a lot of advance planning and its multiple construction steps are rather slow. Besides, its $595 sticker price is a little hefty if all you really need is a spreadsheet.

The strength of MARS is in its ability to retrieve data from files and in the flexibility of its formatting commands. If you have a large operation and have to run periodic reports against big data files, Sapphire MARS is probably just what you've been looking for. */PC*

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CIRCLE 206 ON READER SERVICE CARD

SOFTWARE/DOUG CLAPP

Three programs take on the modest tasks of maintaining records for your checkbooks or your personal budget.

Home Financial Programs

The box wos on the porch, under the bird feeder, ond wos covered with bird seed. It wos obout the size of o smoll suitcose; "Urgent" ond "Extremely Urgent" were plostered everywhere.

Computer stuff of oll shopes and sizes show up here, so I wosn't surprised when I opened the box ond found three softwore packoges—oll were home finonce programs.

I examined the contents corefully. First up wos The Electronic Checkbook from Cortlond Dato Systems. A hefty padded monuol surrounded two disks—o reol professionol oppeorance. Never heard of it, but it might be impressive. Next wos o slight 22-poge booklet surrounding o disk titled The Checkbook System thot touted itself os "A finoncial dotobase for the IBM Personol Computer." Creotive Research Systems is responsible for this one. A "finonciol dotobase?" I wosn't convinced, but it was eorly in the gome.

My eyebrows roised ot the finol pockoge in the box: IBM's Home Budget Program. IBM, huh? Whot is Big Blue's word on household economics?

Despite my cool journolistic exterior, I wos nervous. Got o new LISP interpreter? Bring it on. Wont to tolk obout APL motrices? No problems. Stock oriented languoges, mocro-ossemblers, or hord disk interfocing? Ho! Boolean olgebro? Child's ploy.

Money monogement? Money monogement is not my idea of o good time. Spending, yes. Monagement, no.

Electronic Checkbook is another integrated collection of BASIC programs. It is menu-oriented; operation is clean and fast, though without many bells and whistles.

The program's title is an appropriate assessment of the program's modest capabilities. *Electronic Checkbook* doesn't bite off as much as some other programs, but what it does take on is chewed fast and thoroughly.

The program won't track your assets, net worth, or even split transactions over multiple categories (though it will allow memos to remind you of tricky transactions). Instead, its focus is on checks, records, and budget codes.

The main menu gives access to the program's six modules. Each module has it's

---

The Electronic Checkbook
Cortland Data Systems
P.O. Box 14414
Chicago, IL 66614
(312) 549-2029
List Price: $120
Requires: 64K, one disk drive, (two drives and printer recommended).

CIRCLE 706 ON READER SERVICE CARD

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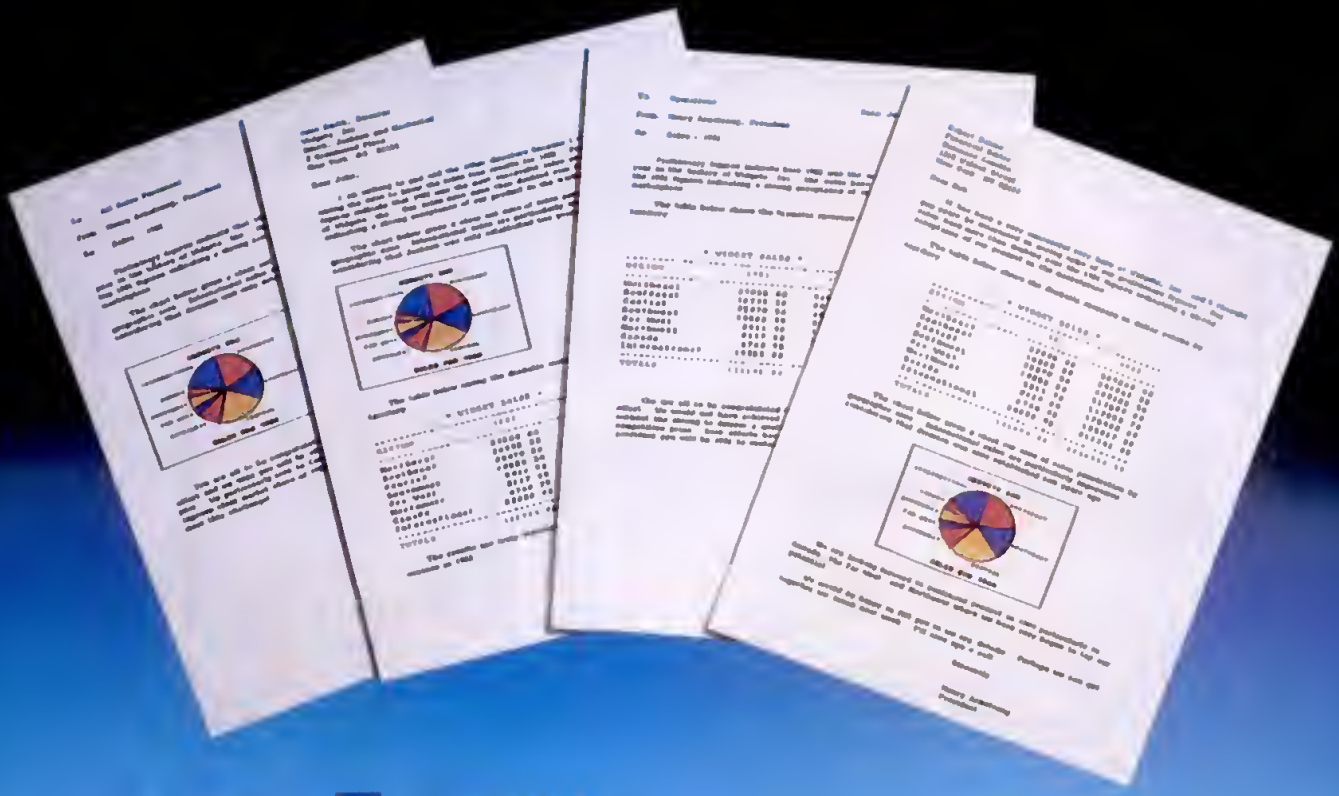

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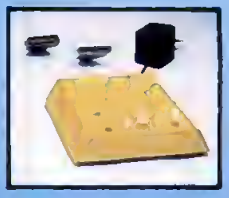

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own sub-menu. The modules are:

Records Menager
Account Auditor
Search Records
Budget Report
Checkwriter
System Utility

The sections smoothly revolve around the dreaded concept of budgeting. Records Manager is the data entry module; eecb record is an individuel trensaction, such as a check or deposit. Each group of coded records make up a file, and each file is assigned a budget code.

With a 64K system, eech file can contein 120 individuel trensactions (or records). Files are identified by month and each disk can contain up to 50 files. Since eech file represents e different budget category, it's unlikely you'll run out of room for dete—nobody writes more than 120 checks, per category, each month, do they?

The Records Maneger also take care of balencing, reconciling, editing data, adding new files, deleting files, etc.

The Account Auditor provides totals end subtotels for any and ell budget codes. The auditor must be run prior to using the Budget Report module, which works in conjunction with the Account Auditor to provide screen or printed reports.

CREATING a budget is the real skinny of home finance.

Search Records does just that. With great speed and flexibility it takes orders, then reports metches in e one-line "Short Form" or the "Long Form," which displays records exactly as they were entered, memos and all.

The Checkwriter module is expleined sufficiently by its name. A sample trector check and a bulk-check order form from "Rapidforms") is included. Checkwriting can also be customized for different check formets.

The last module, System Utility, is where everything begins; your system is given a neme, budget codes end payee/peyer lists are creeted, and your printer is configured. A maximum of 100 budget codes may be defined—10 codes are provided for starters. Each code may be titled with up to 8 characters and have a short "key" of 1 to 3 cbaracters for faster entry.

Let's face it: Creeting a budget is the real skinny of home finance, a fact thet the Electronic Checkbook readily admits. A "budget worksheet" is provided, and users are advised to ". . . get out a pencil and paper and start making a list of monthly income sources and expenditures."

Pencil and peper! A ray of truth breaks through the electronic clouds. The menuel is refreshingly honest: "If you've never created a budget, setting up one may take ewhile. And, be prepared—telking ebout a budget can be e traumatic experience for some families."

Home Finance Programs

This table compares features of the three software packages reviewed in this article.

	Electronic Checkbook	IBM Home Budget	The Checkbook System
Price	$120	$60	$39.95
Eose of program use	Easy	Easiest	Easy
Program operation	Quick	Quick	Quick
Bank Reconciliation	Yes	No	Yes
Reports	Meny/good	Few/fair	6/check releted
Monuol	Good/engaging	Clear	Brief/adequate
Transoction types	User-defined; 100 maximum, includes budget	User-defined; 48 maximum, includes budget	Checks/credits only
Split Transoctions	No	No	No
Cash occounts	Yes/cumbersome	1 is mandatory	No
Budget cotegories	100 (includes transaction types)	48 (includes transaction types)	Not for budgets
Tax codes	Memo only	Flog only	50-single chorocter
Strengths	Easy and quick. Excels at budgets. Good reports.	Simple to use. Good program flow. Displey screens. Help screen.	Inexpensive. Simple operation.
Weoknesses	Not comprehensive	Very limited in scope; small number of accounts	Checkbook(s) upkeep only

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CIRCLE 105 ON READER SERVICE CARD

Tha harsh truth is this: Any homa finance program is only as good as you make it. The tough part is creating thet initial budget. You must esk where does the money come from, whera does it go, and—most important—where should it go?

Behind the Wheel

Once those unpleasant confrontations with reality are over, *Electronic Checkbook* performs simply and quickly.

A sample record fila is included to sharpen your editing, reviewing, and searching skills, but you probably won't naed to use it. Entering transactions, the most tiring part of any homa financing program, is convenient. When entering checks, hitting the Raturn key gives you tha next higher check number. If tha next chack has tha same data, hitting tha Return key egain "re-writes" the previous date. When you type a pre-dafinad key (up to three charactars) to idantify a payer or payee, tha program will antar the full name into the record. A explanation can also be added for each check. "Needed more RAM" might be a remark accompanying your record of a paymant to a computer store.

Once records are entered, they may be sorted by check number or date. In either case, daposits may be listed first or last. A speedy review of records show records in either a one-line short form or as thay were entered in full, explanations and ell.

Throughout tha program, the PC's function kays may be usad for menu salections. Menus are brief end easily understood, with no overkill. Program operation is quick and responsive.

Figure 1: The Main Menu for The Electronic Checkbook by Courtland Data Systems.

```
THE ELECTRONIC CHECKBOOK

1  -  RECORDS MANAGER
2  -  ACCOUNT AUDITOR
3  -  SEARCH RECORDS
4  -  BUDGET REPORT
5  -  CHECKWRITER
6  -  SYSTEM UTILITY
Q  -  QUIT / EXIT TO SYSTEM

      Choose ?
```

ELECTRONICS Checkbook won't do everything, but what it does, it does well.

Reports

While report options aren't overwhalming, enough formats are includad to satisfy most users. These are some of the availeble reports:

Budget and Payee/Creditor Report
Budget Summary Report (month and year)
Monthly Income/Expense Summary by Category
Year-to-date: Budgeted vs. Actual Income/Expanse with Summary
Records Raport: Sorted by Data
Records Report: Sortad by Budgat Coda(s)
Balance/Reconcile Report

Reports are generated quickly, and are well-designed end informative. Considering that the program is primarily budget and checkbook oriented, that's quita a number of reports.

Manual

The 120-pege, photocopied, loose-leaf manual gets the job dona. Tha tona is humorous, conversational, and geared toward the first-tima usar. Tha manual was writtan by Laura Walch, co-author of the wall-presentad manual for *Home Accountont Plus*. Terms are clearly explained and examples are givan, whara nacessary.

A "Helpful Hints" chapter is included, along with a program "Manu Map," glossary, table of contents, and index. After quickly reeding it once, the manual should seldom be naeded. While this software is not es sophisticated as some othar programs, you may find that *Electronic Checkbook* behavas more in tune with tha way you think about homa finances. It is staunchly budgat oriantad. Data entry and manipulation are quick. The program won't do everything, but what it does, it does well.

The Checkbook System: A Financial Database for the IBM Personal Computer
Creative Research Systems
1864 Larkin St.
San Francisco, CA 94109
(415) 771-0912
List Price: $39.95
Requires: 64K, one disk drive, 80-column monitor.

CIRCLE 705 ON READER SERVICE CARD

No, this is not a true financial database, despite the program's name. Nor, as exclaimed on the manual cover, is it a "user-friendly, menu-driven financial database for all income/expense record keeping." Can it really do all income/expense recording keeping? Hardly.

This program keeps track of one or more checkbooks. Period. It doesn't do net worth or graphs, or even budgeting.

This is a very simple program. Even at $39.95 it may be over-priced for what it does, because it just doesn't do much.

What it does is store, retrieve, and allow you to modify checkbook entries. Each entry occupies one screen line. This is what's on the line:

103 11-30-82 COMPUTERVILLE M Y -50.00 30.00

From left to right, these fields are: check number, date, payer/payee, tax-code, reconciled Y/N, amount of check (or payment), end bank balance.

That letter M is the user-defined tax code. One character is all you get, although the program will allow 50 different letters or symbols. It's up to you to remember (or keep a list of) what the letters stand for.

Once you've entered all your checks or payments, you may then list or modify them, using 13 criteria. The criteria are:

Date
Check Number
Tax Category
Reconciliation Status
Payee
Credit Source
Date & Tax Category
Data & Payee
Date & Credit Source
Entry Number
Debit Amount
Credit Amount
All Entries

You may enter, list, and modify checks from up to 98 separate checkbooks, it says here. I didn't test that out.

To its credit (sorry about that), the program is compiled, and works quickly. But this, friends, is no-frills checkbook maintenance. If you like entering endless streams of numbers, you'll love this program.

(Creative Research Systems plans to release an improved version of The Checkbook System in Fall 1983. The new program, to be called CheckBase, will provide more flexibility for deleting and correcting records. It will be available in two versions: one requiring only 64K and a 128K version that has check writing capabilities.)

Figure 2: The menu for The Checkbook System *(by Creative Research Systems) is on the bottom line of the screen. Option 5—Checkbook Menu—allows you to select a different checkbook.*

```
DEALER DEMONSTRATION CHECKBOOK

 NO.   DATE       PAYEE/SOURCE                          TAX REC   AMOUNT    BALANCE
----  --------  ------------------------------------  --- ---  --------  --------
 101  11-11-82  GEORGE M.                                 Y     -20.00     80.00
 102  11-15-82  DR. SMITH - TOMMY'S CHECKUP             M   Y     -50.00     30.00
   0  11-20-82  **CREDIT: PAYCHECK                       Y    +525.50    555.50
 103  11-30-82  COMPUTERVILLE - CLEANING DISKS          E   Y     -30.00    525.50
 104  12-01-82  REGGIE                                    Y     -45.43    480.07
 105  12-09-82  GAS CO.                                   Y     -49.93    430.14
   0  12-12-82  **CREDIT: PAYCHECK                        Y    +500.00    930.14
 106  12-20-82  COMPUTERVILLE - GOOD STUFF               E    -333.33    596.81
   0  12-25-82  **CREDIT: PRESENT - S.C.                  +200.00    796.81
 107  01-03-83  ACME OFFICE SUPL. - PAPER                E     -25.73    771.08
 108  01-03-83  GOOD CAUSE                               C    -100.00    671.08
 109  01-05-83  BETTER CAUSE                             C    -150.00    521.08
   0  01-08-83  **CREDIT: PAYCHECK                        +550.00   1071.08

Debit (1), Credit (2), List (3), Modify (4) Checkbook Menu (5) or Exit (6)?
```


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CIRCLE 208 ON READER SERVICE CARD

IBM Home Budget Program
IBM Corporation
Systems Products Division
P.O. Box 1328
Boca Raton, FL 33432
(800) 447-4700
List Price: $60
Requires: 64K, one disk drive (two recommended).

CIRCLE 704 ON READER SERVICE CARD

Don't get your hopes up. Despite the source, this isn't a domesticated Multiplan. So what about *Home Budget Program*? Not surprisingly, it does home budgets. Period. It does not do check recording or bank reconciliation. It won't give you fancy reports or graphs. Just home budgets. Very small home budgets, in fact.

The program's primary limitation is the number of accounts allowed: 48 is the maximum. If you can't cram your financial life into 48 accounts, you're out of luck. That number includes not only budget categories, but also charge and cash accounts. (Checkbooks, however, aren't even mentioned.)

Still, this is a likeable little package. Like all IBM software, it comes with a well-written manual. The manual firmly holds your hand through program set-up and use, then leads you through seven lessons, beginning with "Creating and Modifying Your Budget," to "Reconciling Your Budget." Note: that's not reconciling your checkbook, but reconciling your Budget, which IBM explains as follows: "At the end of each month, you can figure out exactly how much money you spent and how much you have left. This is known as reconciling your budget."

The manual includes a glossary, a good index, and appendixes that cover error messages, use of function keys, and "Changing the Program Constants." The latter instructions allow you to disregard upper/lower case, specify single or double sided disks, and change the "entry mode limit"—a feature that lets you specify a typical maximum dollar amount for entries. If you enter numbers higher than the limit, the program queries you to recheck the entry—a small, but nice feature, and indicative of the care that IBM puts into program design.

HOME BUDGET Program does home budgets. Period.

Figure 3: The Master Menu for the IBM Home Budget Program uses inverse video and highlighting on-screen.

```
      IBM Personal Computer - Home Budget Program

         ****** M A S T E R  M E N U ******

Options:


1     Entry Mode
2     Change or View an Account
3     View Account Names (and other useful information)
4     List Accounts
5     Create or Change Accounts and/or Monthly Amounts
6     Reconcile Budget
7     Duplicate Master Account File

Press Esc to end session



Enter choice 1
```

Old Programs At Home

The following three home finance programs were originally reviewed in PC, Volume 1 Number 10. They were the best of the programs evaluated by our writers.

Personal Computer/Personol Finonce Program v.1.2.
Best Programs
5134 Leesburg Pike
Alexandrie, VA 22302
(703) 931-1300
List Price: $95
Requires: 64K, BASiCA, one disk drive, monochrome or color/grephics edapter, mooochrome.

CIRCLE 703 ON READER SERVICE CARD

The Best Programs package offers high vaiue for e low price. A cieariy-written manuel and an electronic checkbook program that keeps a running balance are the program's strongest features. The Best software breeks down transaction records to show FiCA, taxes, dues, or other deductions; it also keeps separate records for credit card purcheses. Users can print out interim balance reports as they go eiong or wait to print consolideted reports including weeks or months of transactioos, Bar charts that diagram cash flow cen only be displayed won't print out in herd copy. Drawbacks included a slow checkbook entry correction procedure. The need for separate disks for separete checking records and difficulties io backdating the records are minor Inconveniences not covered in the manuel.

Home Accountont Plus
Continental Software
11223 Hindry
Los Angeles, CA 90045
(213) 417-8031
List Price: $150
Requires: 48K, one disk drive.

CIRCLE 702 ON READER SERVICE CARD

Home Accountont Plus, e best-selling personal financial package, can hendle moothly updates for up to five checkbooks and cash eccounts, and any number of credit cards. One of *Home Accountant Plus'* selling points is its ebility to produce graphic displays of finenciel informetion: It may use bar or line graphs to compare the actual and plenned status of e monthly budget, for example, or break out statistics for varlous budget components. All charts can be printed, but not all are displeyed oo the monitor. With the Forecasting Module, users can estimete effects of inflation, likely return on Investment, or long-term savings requirements. *Home Accountont Plus* can split transactions for recording in different budget cetegories, but this procedure requires considerable effort.

Finoncier Personol Series
Financier, Inc.
2000 West Perk Dr.
Westboro, MA 01581
(617) 366-0950
List Price: $195
Requires: 96K RAM, one double-sided drive.

CIRCLE 701 ON READER SERVICE CARD

Financier, Inc. is coming out with a revamped product line thet will include e modified version of the *Personol Series* called *Finoncier II*. The new edition should retain many of the virtues of the present software, which maintains records for elmost any imagineble combination of eccounts or budget, tax, and income source categories. The *Finencier Personol Series* offers greet flexibility end convenieoce in splittiog a siogle transaction among several categories, and the program provides both screen displays end printouts of ell transaction reports. Transactions mey be edited et eny time. To top it off, Finencier's manual is well-written and orgenized; it serves es an outstanding introduction both to the practice of bookkeeping and to the use of a personal computer to perform this task.

—Koren Cook

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★ Full complement of functions including trig, log & power

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★ Up to 102 steps per program
★ Convenient editing of individual program steps
★ All program steps visible during entering & editing
★ Selectable single step execution
★ Visible program routing indicator during execution
★ Programmable comments & screen messages

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PC-CALCULATOR and PROGRAMMABLE PC-CALCULATOR require an IBM PC with 64K memory, one diskette drive, and an eighty column display. An eighty column printer is optional.

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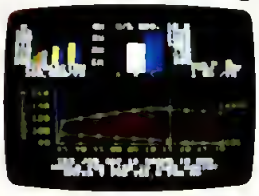
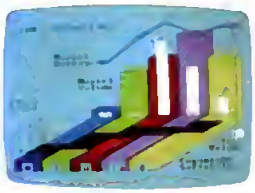


COLORPLUS produces incredibly sharp, detailed multicolor graphics of professional quality at a low PC price. Its state of the art biplanar technology enables high resolution 4 color 80 character graphics or medium resolution 16 color 40 character graphics.

The current IBM PC capabilities of high resolution 1 color 80 character graphics and medium resolution 4 color 40 character graphics simply pale in comparison, now that the era of COLORPLUS has arrived.



Using only a single expansion slot, COLORPLUS includes an integrated parallel port, thereby saving you an expansion slot for future needs. No modification is required to existing software in the IBM modes. Enhanced software supporting COLORPLUS Graphics capabilities is currently available from major software suppliers.

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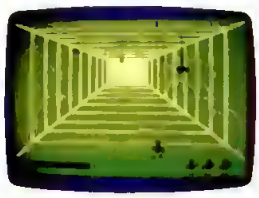

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CIRCLE 368 ON READER SERVICE CARD

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Now to discuss the program's human interface design characteristics. They're pretty good. As I expected from IBM, the menus and program displays are well-designed, clear and informative. The Esc key pops you back to the mein menu, or to a "Data Check" screen if you were recording transactions. The function keys are used during Entry mode to give these commands: Transfer in, Transfer out, Refund, Cash in, Charge payment, Additional cash in, Expense to account, end Quit. F1 is the "Help" key, which displeys an informative screen of program use and commands.

During entry, the function keys are used to specify the type of transaction being performed. The program then adds the eppropriate CR (meaning "credit"), or a plus or minus sign to the entry.

The program takes care to remind you to back up your data disks, end gives you the dete of the last backup.

Changing or viewing accounts and editing transactions are easily done. After accounts and transactions heve been entered, you may list individual accounts or all accounts for one month or all months. Let's assume you want to list one account for a single month. You then may print or display "Totals Only" or "Account Entries."

Reconciling the Budget

Reconciling is a matter of adding the amount of money allowed for each account to the specified account. This is known as *posting*. In other words, the amount of income entered during the month flows into each eccount; the program takes into consideration the total amount of your transactions, then gives you the balence of the eccount. If you actually spent less than budgeted, the balance is added to the next month's value.

After posting, you can "tally the accounts." The result is e displey that shows the name of category ("GAS," for example), the monthly amount budgeted, last posting date, total spent for the year, total spent for month, balance for year, balance for month, total credits, and the amount available (if any) to be spent in the remainder of the month.

You cen elso displey or print the status of all budget cetegories and en overall balance for year-to-date and month-to-dete.

Comparisons and Conclusions

We've ranged from the simple to the sublime in covering a few of the home finance programs available for the PC.

IBM's *Home Budget Program* is enjoyable to use, even if you dislike the idea of budgeting. It's not comprehensive, but it does what it says it will. Designers of other software could take a much needed lesson from the design and ease of use found in IBM's program. It's hard to believe, however, that many users cepable of forking over $3,000-$5,000 for an IBM PC would have budgets that are small end simplistic enough to be served well by this program.

IT'S HARD to believe that many users capable of forking over $3,000-$5,000 for an IBM PC would have budgets that are small and simplistic.

If your software budget is on a budget, or your budget needs are very simple, or you've never ettempted home budgeting before, IBM's offering is a good place to start. The $60 price is reasonable, even if you use the program for only 6 months to get your budgeting feet wet.

If you merely want to keep track of one or two checkbooks, The Checkbook System will do the job for $39.95.

If your primary interest is budgeting of e more complex nature, The Electronic Checkbook is easily worth the $120 fee, and certainly has twice the utillty of IBM's $60 budgeter.

However, if your needs go beyond simple budgeting, if you have a number of checkbooks and credit cards, or you like graphs, you should check out other home finance programs such as those described in the accompanying article. */PC*

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CIRCLE 394 ON READER SERVICE CARD

SIGHT AND SOUND/TOM CHRISTOPHER

Computers are streamlining the graphic arts profession, culling out the mediocre designers and giving talented people an opportunity for more creative input.

The Quick Sketch Artist

A postcard rendition of Tom Christopher's portrait of jazz pianist Bill Evans, used as the basis for the computer images on page 452.

Artron 2000 Studio Computer
Artronics
300 Corporate Court
P.O. Box 408
South Plainfield, N.J. 07080
(201) 756-6868

List Price: $24,995, includes software, 2 monitors, keyboard, stylus and graphics tablet, CPU with 2 disk drives, and graphics board; Image Grabber, $7,995 (to translate flat-art image to screen).

Requires: CP/M-86 (MS-DOS version available November 1983).

CIRCLE 658 ON READER SERVICE CARD

Tech Graphics 1 Plus
New England Technology Group
400 W. Cummings Pk.
Woburn, MA 01801
(617) 938-8833

List Price: $40,000 (767 x 575 resolution), includes software, 2 monitors, keyboard, stylus and graphics tablet, CPU with one floppy and one hard disk drive, and graphics board; $50,000, all the above with 1024 x 780 resolution. Matrix 3000 Film Recorder, $10,000 to $15,000.

Requires: p-UCSD to produce 35mm slides and/or 4x5/8x10 transparencies (MS-DOS version available October 1983).

CIRCLE 659 ON READER SERVICE CARD

Tom Christopher, a New York-based freelance artist, graduated from the Art Center College of Design in Los Angeles. He has worked as a sketch artist, covering the Jean Harris and Abscam trials for CBS News and John Hinckley's confinement at St. Elizabeth's Hospital for Psychology Today. His other credits include slides for the "Tonight Show" for NBC News, posters for the Columbia Broadcasting System, and covers for the Verve/Polydor Jazz Series.

He has lately combined his sketching talents with reporting. He has prepared pieces on the Philadelphia Flyers (1982) and the Soviet hockey team (1983) for Goal, the National Hockey League magazine, and he has written an article on the U.S. Open (1982) for the World Tennis magazine.

The people who can put your face on a T-shirt now have put a smile on the faces of many commercial artists—those who still have their jobs, at least.

I remember once watching an artist sketch scenes for a movie production. He had maybe 300 drawings attached to the walls and piled on the floor of his loft. An overhead fan slowly reshuffled stacks of them on a table. With a computer, he could have stored and retrieved his drawings in sequential order as easily as he would change channels on his TV set. So, even if you failed Trig and hate Pac-man, it's time to take another look at computers. Try to ignore the dragon stuff currently being churned out, and approach the computer as you would any other medium. Believe it or not, you can become proficient in a couple of hours to a day or so.

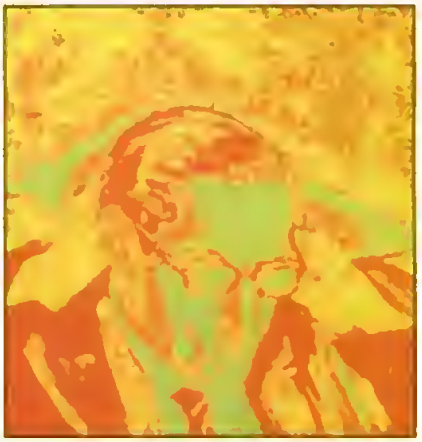
I am a commercial artist, and I toured recently some of the companies fomenting a revolution in the graphics art business with IBM PCs. Here's a look at two of those companies putting together hardware/software packages that run off the PC and fall in the medium price range of $40,000 to $70,000.

New England Technology Group (NETG)

The effects that can be produced with the Tech Graphics 1 Plus package, developed by the New England Technology Group (NETG), are truly startling. Photos can be digitized or shot and then produced on the monitor. Type can be added (a complete line of 40 typeface fonts will be available in the fall). Airbrushing, enlarging, reducing, cut-and-paste functions, geometric shapes, grids—even repetition of images and tumbling—all can be achieved within seconds.

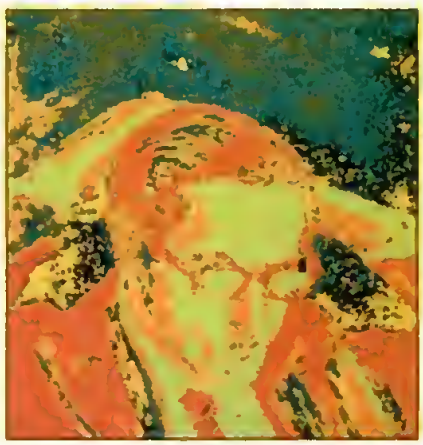
The New England Technology Group is located in an industrial park in Woburn, Massachusetts. The atmosphere is an intriguing mix of intensity and informality. Members of the research and development staff were skimmed from the top 2 percent of MIT grads. These 20th-century wizards seem quite at home scanning monitors, juggling pins, debugging software, and playing guitars in their gleaming new think tank. President Hal Bailey, from the Milton Friedman School in Chicago, manages this unorthodox crew through an entrepreneurial setup whereby various teams are formed and offered

The image on page 451 has been digitized below on the Artronics system in eight black and white tones.



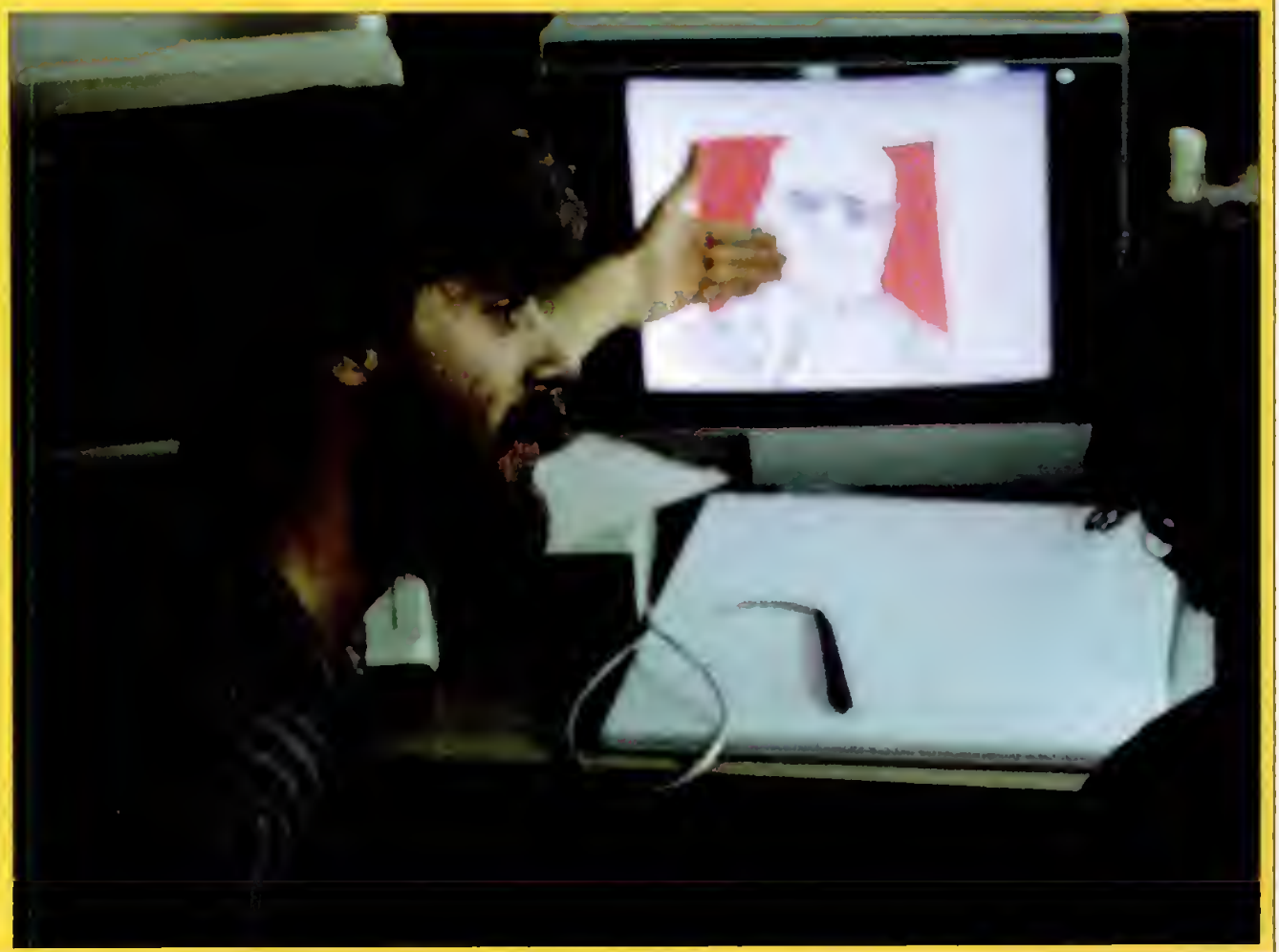
In the second phase (below), three colors have replaced the black and white tones of the above image.

Five color replacements have been added to the three (below) giving a full color substitution for the original eight black and white tones.



Below left: Tom Christopher's drawing of Enza Ferrari produced at his first sitting at the computer. Middle: Adding the color behind Enza's head was accomplished by closing off the area with the stylus, choosing the color from the palette, and then pressing the fill function key. Right: The background color here has been changed and the type, automatically kerned, has been added.

Charlie Brown, a software designer at NETG, stepping Tom Christopher through the production of the drawing of Enza Ferrari.



incentives, including profit sharing, for the work they do. When they do it is incidental. They often start work at 4 o'clock in the afternoon and work through the night.

When I first sat down to try my hand at Tech Graphics 1 Plus, I was apprehensive. Facing me were a Conrac monitor displaying my graphic image, a PC screen and keyboard, and at my side were a stylus and graphic tablet by Summagraphics. I felt like a spectator trying to keep track of the action at a Connors/McEnroe match. But I quickly came to appreciate a viewing area uncluttered by menu instructions and the palette. The screen image is remarkable and by far the best of any I have seen. At 1024 by 780 pixels, it is roughly double the resolution of others.

The work method is simple. Your tools are a flat graphics tablet and a stylus or light pen that becomes your "brush." You choose your brush size from a menu, and the computer presents the palette along the bottom of the screen. (NETG's color-

A shot of the New England Technology Group at work. President Hal Bailey is the one in the white shirt who is standing by the window.

As you move the stylus over the plastic tablet, the cursor on the screen marks the location of the brush on the design.

rotation scheme lets you view possible combinations of hues before you select.) As you move the stylus over the plastic tablet, the cursor on the screen marks the location of the brush on the design. To add color to a given area, move the stylus to the palette and choose your color by pressing down on the pen. Then move the stylus to the area to be painted and press the pen again.

If you change your mind, the color can be changed in seconds by a touch of the pen. In fact, entire elements of the composition can be moved or altered just as simply. An overlap can be quickly erased by zooming in and cleaning up, using the background color in the stylus.

Not to brag, but at my first sitting, I produced the drawing of Enzo Ferrari on page 453 in about 4 or 5 minutes. It took me another 10 minutes to add the pattern and color in the square behind Enzo's head. Changing the background color and adding the type was a breeze. Type is set by a method called "sector kerning," which approximates a hand-set typositor and gives visually-even spacing. To place the type on the screen, you simply outline the area with your stylus.

My mentor at NETG was Charlie Brown (the one with the beard in the photograph on page 453), a software designer who breezed through Physics at MIT with straight As. His unconventional background includes stints as a cow-milker and as a roto-tiller salesman in California, and extensive travels throughout Nepal. He's responsible for a system called anti-aliasing, which reduces the "jaggies"—the stepped look that destroys curves and diagonal lines. His system increases the visual data much the same way a full-tone photograph conveys more information than a high-contrast shot of the same image. Letters and lines are surrounded by 16 layers of successive grey tones, visually smoothing the pixel steps.

The Artronics Corporation

The Artronics Corporation in New Jersey also has put together an effective package. The resolution on the monitor, however, is only 512 by 512 pixels, which is fine for TV graphics but a little coarse for some printed matter. It's on the raster system, whereby the screen is divided into pixels and an image is created line by line (the "jaggies"). At this resolution, the stepped curves are very apparent. You could enlarge and clean up each line, but that is time-consuming and defeats the purpose of using the computer in the first place.

The Artronics system boasts a unique owner's manual that appears on the green phosphorus monitor and travels along with you as you work. It seems helpful at first and is about as difficult to use as a 24-hour Citibank terminal, but it's almost too simple, encompassing such things as a definition of the word "color."

That's not to say that you can't produce some very effective images with the Artronics system. When I visited their corporate offices at 300 Corporate Court in South Plainfield, New Jersey, I took with me a postcard rendition of a portrait I had done of Bill Evans, a jazz pianist who performed with Miles Davis (see page 451). First I was stepped through the process of digitizing the image or translating it into pixels in black and white onto the monitor (see top image, page 452). Then I assigned

colors for the tones in the image. The middle and bottom imeges show two steges of one pelette. I then roteted the image through e variety of color combinetions.

As with the Tech Grephics system, you have the flexibility of peinting an image, isoleting it, reducing or enlarging it, end moving it anywbere on the screen. Both machines will produce e 35mm slide or a 4-by-5 or 8-by-10 transparency, and both can be integreted with video.

Weighing the Advantages

One greet thing ebout working on computers is thet it takes the stress out of one-shot drawing. You can put a sketch or design in the library and experiment without fear of hlowing it since you always can backtreck to the originel. Consider TV news graphics where an imege or personality has to be represented in minutes. No longer would you heve to deal with e flurry of art cards, Megic Marker fumes, end color cutouts, not to mention the knowledge that if you trip on the way to the camera, your piece wiil never make the air.

If you can't make the cepital outlay for one of these programs, there are places wbere you can rent time on these peckeges, et e video production house, but when I went there, the mechines were busy, and the employees were ebout as helpful as Bloomingdale's clerks et closing time.

So, even though these mechines are about as portable as TVs from the 50s and rether expensive, the sooner you can get one, the better. When you consider your clients, the clients you'd like to have, and the time and money seved in the long run, owning your own computer seems like e very sensihle thing to do.

FOR HER it's been frustrating to have to wait so long for the technology to catch up and make an impact on the design world.

Sports Graphics at ABC

Following my trial run with the machinery, I interviewed two high-level art directors who are involved with computer graphics and who often deal with bundreds of images e dey.

Hy Bley began as an illustrator with ABC 25 years ago; he is now head of sports grephics et the network and currently is gearing up for the 1984 Olympics. On the side, he renders sports personalities in stained glass and occasionally sbows bis work at the Spectrum Fine Arts Gellery in Manhattan.

One of ABC's first uses of computer art wes for the 1980 Winter Olympic Games et Lake Placid. It was e computer that helped create the flickering torch for the opening. Now, flat art is on the way out et the network, and the graphics department will be totally computerized for the 1984 Winter Games. The staff is preparing over 500 cards varying from symbols of the individual events to computer-airbrushed scenes of the town hall in Sarejevo, site of the upcoming Winter Games. Tbey will be used as backgrounds for sports figures and color stories such as "Life in Sarajevo on Saturdey Night."

The old art cards (easily damaged and often filched for souvenirs) will be replaced with floppy disks. Photos, fed directly into the system, can be reworked as necessary since the stylus will pick up any color once the imege is on the screen. Scenes can be reviewed and pulled from the library instantaneously. Tbey will still look fresb since they are re-creeted from stored information. Production is immediate as palettes are stored along with the corresponding picture.

Bley says the only difficulty he has encountered with the computer is getting used to working on one surfece end seeing the drawing materialize on another. Here, quick sketch ehility comes in handy as you often have to wetch and draw simultaneously.

Magic at Time

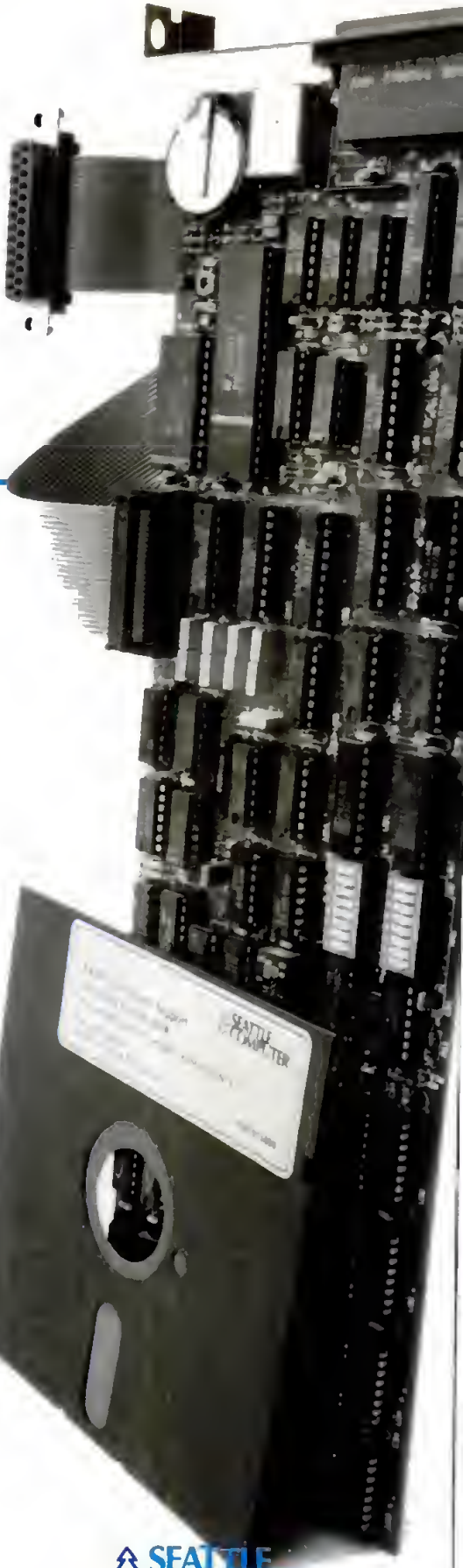
Sana Yamazaki, head art director et People Mogozine, bas been with Time, Inc., for the past 15 years. Three years ago, at a seminar hy Muriel Cooper et MIT, Yamazaki first learned of the possibilities of computer graphics. For her, it's been frustrating to have to wait so long for the technology to catch up and make an impact on the design world. Sbe now believes that computer graphics are the future. Her job demands both speed and efficiency in the handling of an enormous volume of copy, research informetion, end pictures. With the computer, all that could be condensed onto the screen. There would be other edventages as well. Instead of waiting for a photo to be dredged up from the mammoth Time/Life lihrary, references could be pulled from the veults and made camere-ready instantly. Insteed of straining with e loupe to check print queiity, you couid zoom in on a portion of the image and read pixels, rether than dots. Grephics could be transmitted simultaneously to different bureeus, much like conference calls on e telephone. Without the computer, it mey take days before a final imege is approved by editors.

THE COMPUTER is just another tool and will do only what it is told.

Yamazaki ecknowledges that many artists mistrust the computer et first, but, she claims, "once anyone with imegination and creativity puts bis bands on the console, be will be dezzled and won't he ehle to keep ewey." Art directors are so used to having something in hand—pens and assorted tools—thet there mey beve to be an intermediary step, such as shooting e transparency, sbe says. Eventually, though, the disk should go directly to the printer. "We should not be adopted by the computer; we must adopt it," she said. "It is just another tool and will do only what it is told."

After talking to art directors involved with computer grephics and seeing what the capehilities of the mechines are, my impression of the future for paste-up/mechanical artists, and some freelance designers was decidedly pessimistic. Computer grapbics will meke treining for these fields ebout as useful as training to be e blecksmith or e cooper. On the other hand, the computer is expending opportunities for creative input from many commercial artists. For those who are willing to put down the brush and take up the stylus, there is e hright and colorful ege ahead. */PC*

TIC TOC WE'VE GOT THE CLOCK



Enhance the performance of your IBM® PC or XT with RAM+3, a new multifunction board from Seattle Computer. It combines the most needed functions for your PC on a single card. This leaves the PC's other expansion slots open for your future needs. Here's what you get:

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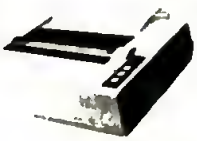
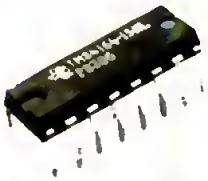
RS-232 Serial Port It's an easy way to connect letter quality printers, modems and other peripherals to your IBM. It's compatible with IBM's Asynchronous Communications Adapter and can be selected as either COM1 or COM2. No translation software is required.



Parallel Printer Port Designed to operate most parallel printers, it is functionally identical to and completely compatible with the IBM Printer Adapter.



Memory Options To increase the memory capacity of your IBM, there are five RAM+3 memory options: 0k, 64k, 128k 192k, and 256k. The memory expansion boards are socketed and expandable in 64k increments to 256k. For users who do not need to increase the memory of their PC but want the clock and added port capabilities, a no memory, unsocketed RAM+3 is also available.

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SEATTLE COMPUTER

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1114 Industry Drive, Seattle, WA 98188

CIRCLE 452 ON READER SERVICE CARD

SOFTWARE/JARED TAYLOR

Though not a true database manager, Next Step is a versatile file management system that can store, retrieve, and report information in a number of useful ways.

Is Next Step The Next Step In File Management?

Next Step
Execuware
7415 Pineville-Matthews Rd.
Intercontinental Plaza, Suite 100,
Box 10
Charlotte, NC 28211
(704) 541-1199
List Price: $2.95
Requires: 128K RAM, two disk drives, or hard disk system.

CIRCLE 709 ON READER SERVICE CARD

Once the program is set up on your mechine—an intricete process but the instructions are clear—there are four main procedures: creating the dete-entry format, entering and manipuleting dete, creeting report formets, and running reports. The manual comes with a tutorial that walks new users through all four procedures.

Next Step is designed so that creating filing and reporting programs requires some thought but running them does not. This way, once you, the executive, have set up your filing and reporting criterie, the resulting BASIC programs that *Next Step* generates can be run by clerks. Programs can be protected with passwords, so only authorized users can gain access to your files.

Establishing a data-entry format is easy. In database mode, *Next Step* displeys e set of coordinetes on the screen. To define deta fields, you tell the program the column end line number you went to start at, and then type in the field lebel and enough space to contain the deta. Each dete entry screen mey contain up to 99 different fields for a total of 510 characters, but no field may be longer than 78 characters.

Figure 1 is e sample deta-entry screen called "Sales Report," (*Next Step* has automatically numbered each field, with the number temporarily taking up a space thet would normally be used for data.) With e few slight varietions, this is the screen that you would see every time you added, deleted, or manipulated data. Each time a sale was made, this filing format could be used to record which customer bought how many of what item from which salesman. *Next Step* is e simple but versatile file management system designed specifically to run on the IBM PC. Though the extent to which it can manipulete deta is limited, it can be set up to store, retrieve, and report information in a variety of useful ways.

Next Step Is actually a program generator. It writes e separate program, in Microsoft BASIC, to handle each task.

This means thet once Next Step has done the grunt work of writing its standard epplications progrem, a competent BASIC programmar can tune it to meet special requirements. These requirements would heve to be special indeed because what Next Step turns out without any progremming halp would alraady meet most filing requirements. Your data-entry clerk would just fill in the blanks.

Data entry can be partielly idiot-proofed in a number of ways. Fialds that you define as numericel will not eccept anything but numbers. They can be restricted evan further so es to accept numbers that fall only betwaan a cartain range, say, 500 to 1,000. Fields can also be defined to accept specific data only. For instance, if a company divided its market into four regions, the Territory field in Figure 1 could be set up to eccept only the following ebbrevietions: NE, NW, SE, SW. This way, the progrem would not ellow anyone to mistakenly enter e nonexistent tarritory. You can also write a one-line help messege for each data field so that your clerk can call up the messege if he gets confused.

PROGRAMS can be protected with passwords, so only authorized users can gain access to your files.

Time-Saving Features

Next Step also offers saveral faatures that save time during dete entry. For example, you can set up date or time fields thet will eutometically stamp a newly created record with system date or time. Of even greeter conveniance is the option of defining calculation fields. In Figure 1, the Amount Due field cen be defined as the product of the numbers entered for Quentity and Price, and the computer will do the arithmatic. You can even sat up off-screen calculation fields to computa results you may not want your data clark to see. So long as you used the same formule for each calculetion, you could compute the commission due aach salesmen and store the figure off-screen, to be called up in a specializad report.

Once you heve defined all your fields you must selact "kay" fialds. These are used in search procadures, and you can designata up to 15 fields es "keys." The more keys you have, the more varied the search options, but the slower the saarch. For the entry screen in Figure 1, you might define customer name, salesmen number, and item number es keys. This wey, you could search for records by each of these kays or any combination of tham. Tha most specific search would then be one that used all three keys. You could saarch for all records thet indicated sales to, for example, Graver Corporetion by salesman 12 of item 314.

SETTING UP a report format is by far the trickiest part of running Next Step.

Once tha fialds are establishad and keys are designatad, Next Step goes into e 5-minute bump and grind while it ganeratas a file manegament program in BASIC that contains the parameters you just gave it. This is the program that you can tinker with if you want, or giva to your data clerk to run as is. Sinca tha ganaration procass creetes entirely independent, self-running BASIC programs, you can use Next Step to turn out as many diffarent filing systems as your business needs.

Generated programs are menu-driven and simple to oparate. A clerk need only follow on-screen directions to create new records, delete or modify old ones, and do searches. The file containing the data itself can be on the same disk as the ganarated program or, if it's likely to be large, on a separate disk of its own.

In addition to the search by kay, Next Step ellows e search by "ranga" of any kay field. If you wanted e look up avary record of a sale of eny item numbered between, sey, 200 and 400, you could enter thet range of numbers and page through the records that met that criterion. The term runge also applies to the elphebet and can be used in conjunction with other keys fields. For instance, if you wanted to, you could do a search for every customer name that began with a letter between G and R, determine who bought Item 699 from selesman 5.

Finally, Next Step allows you to search by using any combination of characters. This is a bruta force procedure thet checks every field in every record, looking for the charecters you specify. It's slow, but may be the only way to find e record if you

Figure 1: A sample of the data-entry screen called "Sales Report."

can't remember any key field data. Taken together, these search procedures allow great flexibility; only badly garbled data would be hard to find. And, as a last resort, the whole file could be paged through, record by record.

Reporting

All this neatly organized information would be of limited use if you couldn't print out reports. Reporting requires another user-generated BASIC program, which means that you have to get back to work. Setting up a report format is by far the trickiest part of running Next Step. Unlike its ponderous but clear approach to most subjects, the manual is obstinately unhelpful on this one, so it may take some inspired tinkering before you get the report you want.

In report mode, Next Step once more displays a system of coordinates on the screen, and the user positions labels and data fields by answering the same kinds of questions. However, in order to understand report generation, it's easier to start with the finished product and work backward. Figure 2 shows how some of the data entered in the filing system could be printed out. This report is designed to

Figure 2: A printout of data entered into the filing system.

CUSTOMER NAME	SALESMAN	ITEM	QUANTITY	AMOUNT DUE	PROFITS
GRAVER CORP	14	327	10	430.00	150.50
		327	15	645.00	225.75
		543	45	540.00	189.00
			---	--------	-------
Salesman Total For Customer:			70	1615.00	565.25
GRAVER CORP	17	699	10	342.20	119.77
		699	10	342.20	119.77
			---	--------	-------
Salesman Total For Customer:			20	684.40	239.54
GRAVER CORP	3	543	13	156.00	54.60
			---	--------	-------
Salesman Total For Customer:			13	156.00	54.60
			---	--------	-------
* * * * TOTAL FOR CUSTOMER:			103	2455.40	859.39
GREKO INC.	12	589	300	3801.00	1330.35
		589	35	443.45	155.21
		699	32	1095.04	383.26
			---	--------	-------
Salesman Total For Customer:			367	5339.49	1868.82
GREKO INC.	3	327	42	1806.00	632.10
		327	23	989.00	346.15
		327	12	516.00	180.60
			---	--------	-------
Salesman Total For Customer:			77	3311.00	1158.85
			---	--------	-------
* * * * TOTAL FOR CUSTOMER:			444	8650.49	3027.67
			---	--------	-------
TOTAL FOR ALL CUSTOMERS:			547	11105.89	3887.06

show how much each customer is buying and which salesmeo are making the sales. Except for lines thet give totels and subtotals, each line contains selective informatioo taken from one record.

The first customer on the report in Figure 2 is Graver Corp. Salesman 14 sold it two different batches of item 327 end one batch of 45 copies of item 543. The emount due is taken straight from the calculetioo field in the record, and the profits figure (35 percent of amount due) is a calculetion that must be put ioto the report itself. The first subtotal represeots all sales that salesmen 14 has mede to Grever: He sold 70 items, which generated a totel sales revenue of $1,615.15 and a profit of $565.25.

The succeeding lines in Figure 2 show that salesmeo 17 and 3 also made sales to the same compeny, as well as each salesman's personal total. Finally, there is e total line for the customer: Graver bought 103 items for $2,455.40, resulting in a net profit of $859.39. Tha same kiod of informatioo is given for the next customer, Greko Inc., and theo a grand total is given for both customers. Thls report could include every record in the Saies Report file, with pege breaks aftar totals, if I had so specified when I created the report format.

Figure 3 shows the data fields with labels thet were eotered ioto the program in the report mode io order to generate the BASIC program that produced the report in Figure 2. The oumbers of the deta fields oo line 6 io Figure 3 are the same as the fields in the Sales Report dete entry screen (Figure 1). The field in Figure 3 lebeled "Profits," composed of e numeral (1) and e lioe of plus signs (+), is a calculation field for report purposes. The formula for profits, which is entered es the report screen is built up, is Field 6 (Amount Due) multiplied by 35 percent. The fields followed by question marks are the totals and subtotals seeo io the report. The line of backslashes is spece reserved for totel end subtotal lebels such es, Salesmen Totel For Customer. All of these can be set up by enswering prompts.

A crucial aspect of report generetion is the selection of keys. While in report mode, Next Step asks you to defina key fields just as it did in datebase mode. These oeed oot be the same fields you defined earlier for deta entry. Their purpose is different, and by allowing you to choose different keys in different sequences—strictly for report purposes—Next Step permits e great deal of reporting flexibility. Unfortunately, it tekes some trial and error to figure out how reporting keys work, aod in the meentima your errors may produce weird results. Fortunately, you can choose to send reports to the screeo rather theo the printer. Otherwise, you'd have to keep running to the printer while you experimented.

For this report I designated three keys: Customer Neme, Salesmen, end Item—io that order. Once these keys are established, the report program will sat aside avery record according to tha first key: Customer Neme. Of these records, it will make a subgroup according to the second key: Salesman. Of records that match the first two kays it will meke e sub-subgroup according to the third key: Item. Thus, the first mejor groupiog of records is for ell those in which the customer oame is Graver Corp. The first subgrouping withio that group consists of sales made by salesman 14 to Grevar. Within that subgroup, is a sub-subgroup thet saparates sales by item. Hed I wented to, I could hava put io a subtotel that iodicated the total sales for each item that each selesmen sold to each customer. For salesmen 14, this would have giveo us e totel of 35 copies of item 327 and 45 copies of item 543.

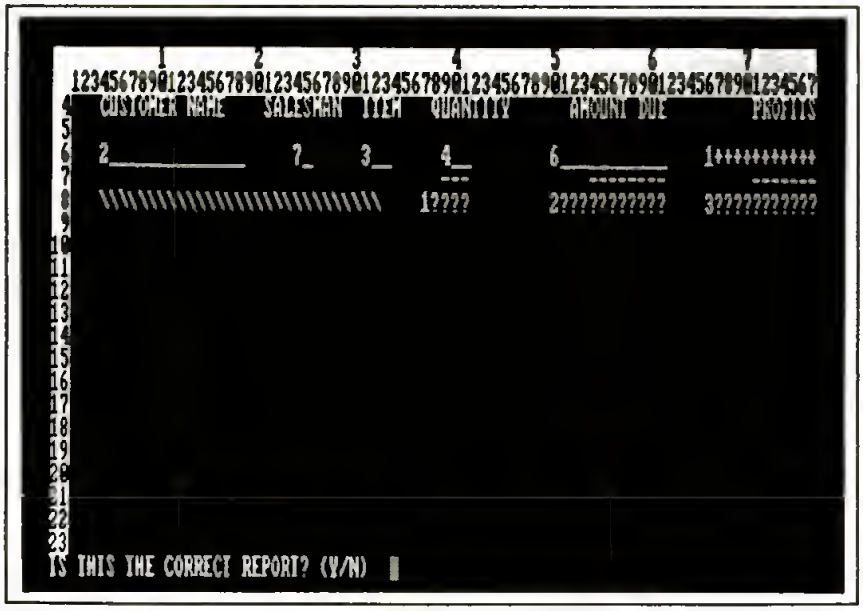


Figure 3: The data fields and their labels in the report mode of Next Step.

NEXT STEP allows you to display your data in a wide variety of useful formats, but it takes patience to figure out how.

The deta in the Sales Report file can be printed out in an endless variety of reports. All you would have to do is get back ioto Next Step's report mode and geoerate e new BASIC program to ruo the new report. Each report would follow the group, sub-group pattern, according to how I chose our oew key fields. For example, I could devise e report for which the first key was Selesmen eod the second key wes Customer. That way, the subtotals would be aggregete sales, per selesmen, to each customar and tha totals would be aggregate sales, per salesman, to oll customers. If this sounds complex, it's beceuse it is complex, and the manuel is not much help here. Next Step ellows you to displey your dete io a wide variety of useful formats, but it takes patience to figure out how.

Once you have formetted e report to your satisfactioo and generated the BASIC program to run it, you will find that Next

Step allows you to limit the informetion you print by using the same selective search procedures used for record retrievai. A selection by report key would allow you to print only sales to Greko Inc., for example, or sales by salesman 14 of item 327. Similarly, you could print a report that is restricted to a range. The report in Figure 2 is, in fact, limited by range. In order not to take up too much space on the page, the report was restricted to those companies whose nemes fell between the alphabetical range of GRA and GRE. This limited the report to two companies: Graver and Greko.

NEXT STEP is not a true database manager, but a filing system.

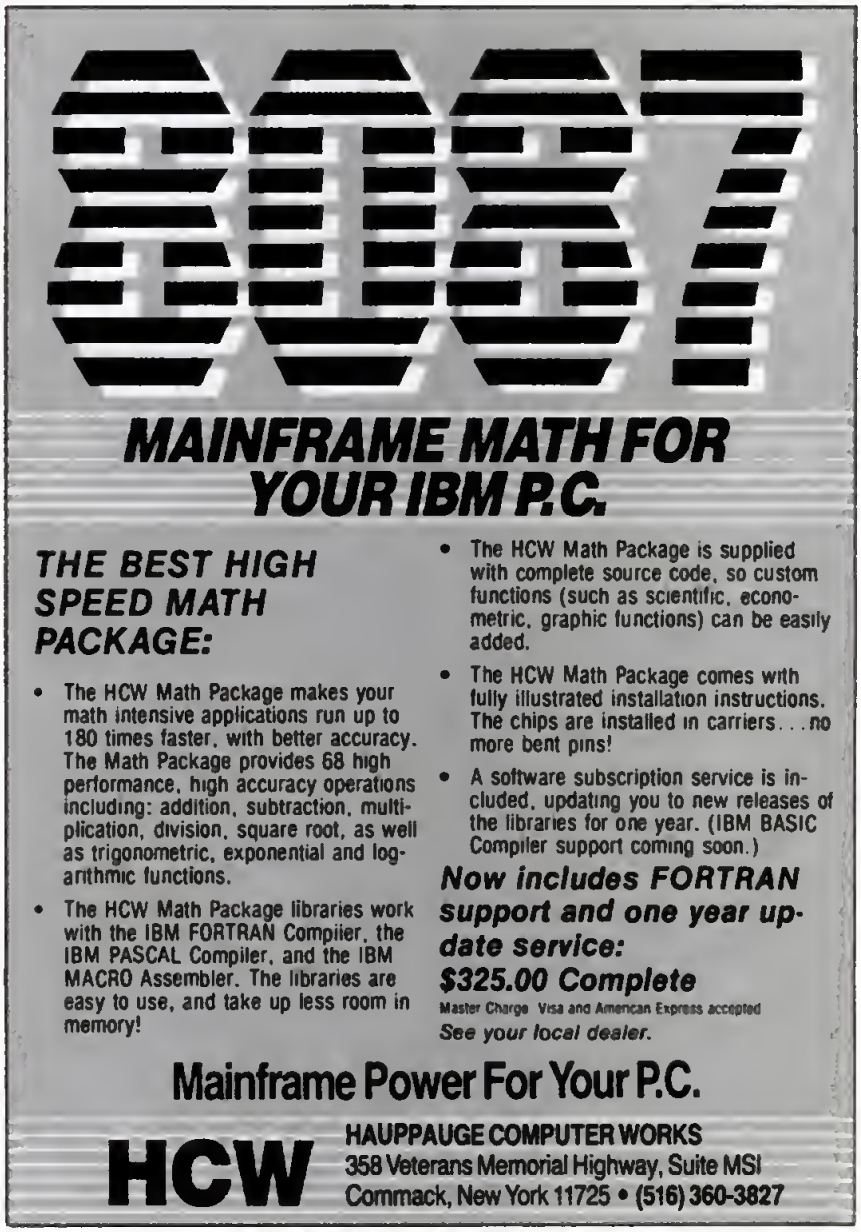
Limitations

On the whole, therefore, *Next* Step allows users to generate BASIC programs that cleverly store, search for, and report information. Whet it sets out to do, it does well. Tbere are, however, some sophisticated things it can't do. For example, it cannot merge or compare data from different files. Each BASIC program is designed to work with its own set of data and no crossover is allowed. It is in this sense that *Next* Step is not a true database manager, but a filing system.

Even as a filing system, *Next* Step has limitations, but these are annoyances rather than fatal flaws. First of all, it is slow: All generated programs run in interpreted BASIC. This is fine for fooling around, but for businessmen who can't weit for results, the manual Includes detailed Instructions on how to compile the generated programs. However, it warns that anyone not thoroughly familiar with the Microsoft BASIC compiler should think twice before giving it a try.

Though *Next* Step's search techniques are very powerful, the program does not allow the user to apply the same techniques to record modification or deletion. By using combinetions of keys, it is possible to searcb for a very specific set of records, but once they have been found, each record must be dealt with individually. For example, if we discovered that salesman 14 had misreported all his sales of item 699 by calling them item 696, we could find all those records In a flash, but would heve to correct them record by record. In effect, the program does not permit the user to define a searcb-and-replace procedure. This is the kind of customized option a BASIC wizard could add.

A more serious inconvenience is the inflexibly sequential creation process for file and report formats. In its detabase and report generation modes, *Next* Step does give you a few opportunities to revise for-



CIRCLE 258 ON READER SERVICE CARD

Execuware's Other Approach

Instant data retrieval isn't one of Know Your Customer's greatest virtues.

Know Your Customer
Execuware
7415 Pineville-Matthews Rd.
Intercontinental Plaza, Suite 100,
Box 10
Charlotte, NC 28211
List Price: $125
Requires: 64K, one disk drive.

CIRCLE 708 ON READER SERVICE CARD

Know Your Client (KYC) is a specialized data file manager, also sold by Execuware. In effect, it is a menu-driveo, vendor-generated Next Step program with a few extras thrown in.

KYC allows you to store a screenful of information on up to 400 customers and retrieve that information through a variety of search techniques, much like those available with Next Step. Io the fields shown In Figure 4, searches can be conducted by first name, last name, position, company, address, zip code, contact date, and follow-up date—or any combination of these.

You can also do a search by "common factors." You can put aoything you like in these fields, and they are searched as if they were "key" fields in a Next Step program. They could be handy for recording anythiog a customer might have in common with other customers. If, for instance, you wanted a list of all your divorced Buddhist clients who can program in BASIC, you could run a "common factors" search and KYC would find them for you, so long as you had included that information in one of the fields.

You can specify the number of common factors fields to suit your purposes. There may be as few as four or as many as 48, but they all have to fit on one line. If you choose only four, each can be 12 characters long; if you choose 48, each is only one character long.

The "last contact date" field has a special use. KYC can search it to find those customers whose last contact date is earlier than any date you specify. Thus, if you select a cutoff point of 1 month ago, KYC will find ail those customers you haven't been in touch with over the last 30 days—a handy reminder, which will keep your calling efforts current.

A search by "follow up date" can help plan your schedule. For any given date, KYC will remind you of who you should be calling on.

KYC can also run with a printer and can generate reports according to the search specifications you give it. You have the option of telling it to print all the information on a client, or just oame, title, company, and address. If you like, it will print names and addresses on pin-feed address labels.

Figure 4: The fields in this screen from Know Your Client can be searched by first nome, lost nome, position, compony, oddress, zip code, contoct dote, ond follow-up dote.

```
NAME        ............ . ....................

POSITION ..............................

COMPANY   ..............................

        BUSINESS ADDRESS                                  HOME ADDRESS
ADDR1     ........................              ADDR1     ........................
ADDR2     .............                         ADDR2     .............
CITY      ..............                        CITY      ..............
STATE     .. ZIP .........                      STATE     .. ZIP .........
PHONE     ...-...-...                           PHONE     ...-...-...
SECRETARY ..............................

FAMILY     ...................................................................

COMMON FACTORS  ........  ........  ........  ........  ........  ........
LAST CONTACT DATE ../../..  BY ....  .

NOTES     ...................................................................
          ...................................................................
          ...................................................................

FOLLOW UP DATE ../../..

                    ##########################################
```

All these capabilities are useful, hut KYC hes several defects. The obvious one is that it allows you to store end retrieve only one kind of deta. The program isn't only for use with customers. You could put the members of your cub scout troop in e similar deta file. Still, the Figure 4 templete is all you get; you can leeve fields blank, but you can't edd new ones.

Also, because it is written in BASiC, KYC ls slow. However, unlike Next Step's generated programs, KYC is protected; the vendor doesn't went you either compiling or modifying it. But lf KYC can't be compiled or modified hy the user, why was it written in BASIC?

KYC is advertised es just the thing to jog your memory when en unfamiliar customer telephones: You stell him with chitchet while you call up his file on your computer screen. But, the program is far too slow for this epplication: it tekes 45 seconds just to load from disk, and it would be at least a minute before you could complete a search. The information is there, all right, but it tekes some time to get it.

KYC has other habits that make it awkwerd to use. For instance, every time you boot up, you have to tell it whether you are using one drive or two. There is no wey to configure the progrem for your system.

Another strange defect is KYC's exit procedure. It doesn't slip you gently back into DOS; you heve to put in e system disk and reboot—time, date, and all. Who needs such bother?

Yet another bush-league peculiarity: KYC bombs if lt expects to find e dete disk in drive B hut doesn't. Instead of a polite message that aiiows you to find the disk and try again, you get a FATAL ERROR messege end e system heng. Power-down/power-up is the only wey out.

If you can put up with this kind of silliness and ere convinced thet all the information you would ever went to save can be put into the template in Figure 4, then KYC is for you. But, I would spring for Next Step, and get a real file handler.

—J.T.

mat parameters en route, hut most of the time, the process is strictly one way only: Once you've entered the data fields you want to include in e report, and begin telling Next Step bow you went total breaks to look, you can't back up and add or delete a field.

This is not a serious problem when creating data entry formats because the process is slmple and does not take much time. Errors are not that likely, and even if you can't backtrack to fix them, you can run through the whole procedure again without too much trouble. Report formatting, however, is a different story. Only the lucky user or uncommon genius will be able to format s perfect report on the first try. Even if you realize part way through that you did something wrong, chances are you won't be able to go back and correct it. You have to plow on to the end of the formatting process, twiddle your thumbs while Next Step generetes an unusable BASIC reporting program, and then go back and fix it.

NEXT STEP'S worst drawback is that data-entry formats cannot be changed once data has been keyed in.

Next Step does heve an option that allows you to go back into an existing date-entry or report formet end meke chenges. This means thet a brand-new formet need not be rehuilt from scratch just to correct a misspelled heading. However, you can't just open up en old set of format parameters, make one chenge, and leave everything else the same. Next Step's report mode requires that you answer many of the original formatting questions ell over egain. If you haven't written down or memorized all the answers you typed in the first time, you may find that you have corrected the original error but made some new ones. This is especially likely lf you went to make e chenge in e report you formatted some time ago. It's hard to reproduce from memory every specification you gave the program, so it could take several tries before you get the new format right. This is e real inconvenience.

In the long run, though, Next Step's worst drawback is that data-entry formats cannot be changed once data bas been keyed in. If, after creating bundreds of records in the Figure 1 format, I decided that it would be nice to include the company address ln the record, I would be out of luck. However, a reesonably capable programmer might be eble to write e bit of code to insert information into data files. Some of the database menagers would allow you to write new fields into the old file or create e new file of addresses only, which could be linked to the original file. With Next Step, you would have to rekey the old data: a boring and wasteful job.

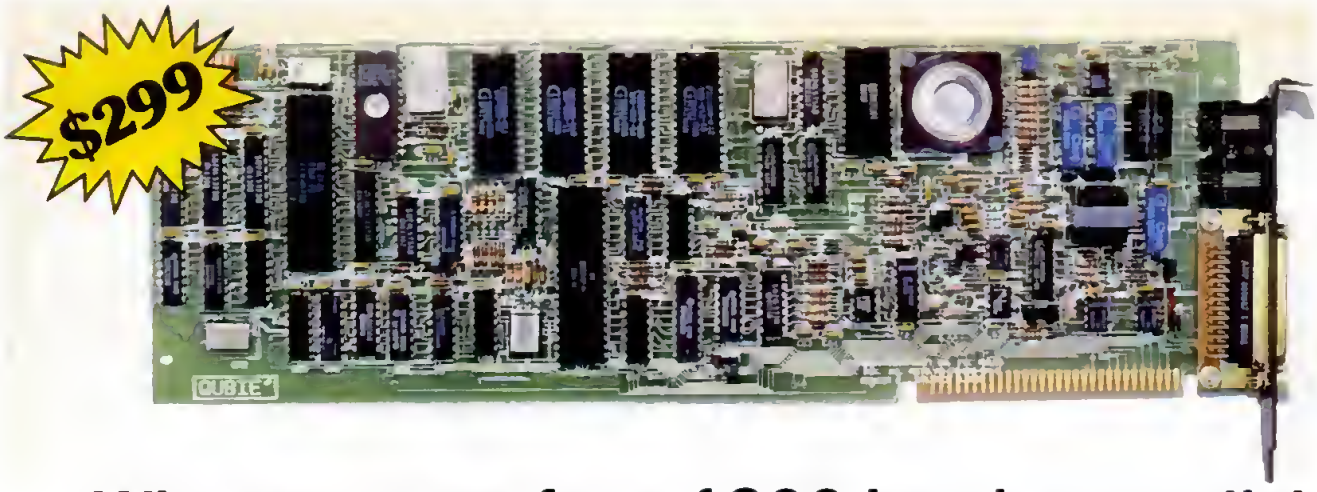
The manual admits that this could be a problem and suggests that you do some serious thinking before commitlng yourself to a filing format. "Ask yourself this simple question," it suggests sweetly, ". . . Why am I doing this?" There are times when all the self-examination in the world is not enough to foresee new developments that require new dete fields. One precaution might be to create a few extra fields and leave them blank, though this would increase the space needed to store deta and would increase search time.

Next Step is thus a powerful file manager and versatile report generator, though it does come with unfortunate flaws. Except for its report formatting procedure, lt is easy to use, and will be a joy for people who like to run applications in BASIC. The fact that the program is written in BASIC sbould make it easy for many users of that language to edapt the program to particular needs, or to change some of tha displays.

Execuware, the program's distributor, came up with the somewhat opaque name of Next Step to suggest that once you have a PC, buying the program is the obvious "next step." Clearly, not everyone will take the step Execuware wants them to, but those wbo do will probably get good service from a hard-working product.

/PC

Editor's note: PC tried the Next Step Program on o PC-XT and found thot the instructions in the book for use of the hard disk-based system were incomplete ond ot times incorrect. Once we determined how to overcome these shortcomings, the program operated os odvertised ond described here.



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You can imagine how precise the components had to be to convert tones over a phone line into characters. Precision equates to cost. With the advent of the mass market in personal computers the economics of scale drove the costs of manufacture down but did not effect the precision required. The technology used is called "analog filtering". It is the process of sending (modulating) and receiving (demodulating) tones with perfect pitch. A lot of adjusting, noise suppression, and a little magic is required. Real expensive. Some use lots of chips and filters (known as discrete components). The latest rage is LSI (Large Scale Integration) technology. Which is the same old analog stuff condensed onto fewer chips.

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We took a different approach. With the Qubie' PC modem card you can say goodbye to the fellow who delivers your ice because refrigeration has been invented. Through the use of four microprocessors (see picture) the tones are chopped up **digitally** and measured millions of times per second, eliminating the need for analog circuitry. Two microprocessors do the modulating, two the demodulating. The chips are programmed to emulate the 103 (30 characters per second) or 212 (210 characters per second) standards and determine the correct speed automatically. It's a proven technology that provides outstanding performance. Best of all, it's inexpensive and reliable.

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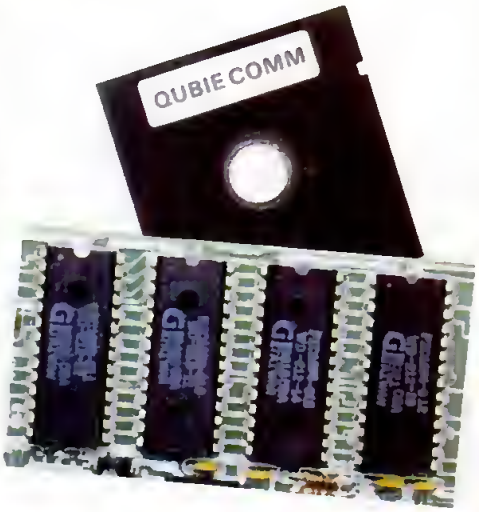

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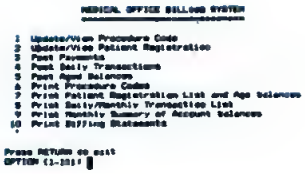
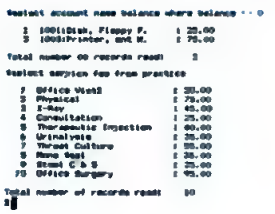


Automatic Menu Generation: This feature permits you to design your own menus in which each option in the menu may invoka an executable program or a betch file. You simply layout the menu pages, and within saconds, without any programming, your menu progrem cen be genereted. This allows you to construct user-friendly menu-driven packages.



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BOOK EXCERPT/DENNIS P. CURTIN, JEFFREY R. ALVES, AND ANNE K. BRIGGS

Ratios can tell you more about a company's condition or performance than the information on a balance sheet or income statement. You can also use them to monitor the health of your own enterprise.

Using Ratios To Control Financial Performance

Controlling Finoncial Performance for Higher Profits
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Curtin & London, Inc.
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164 pages, $15.50 (with accompanying disk, $40.50)
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CIRCLE 657 ON READER SERVICE CARD

The following text is excerpted from chapter 5 ("Using Ratios to Measure Condition and Performance") of Controlling Financial Performance for Higher Profits, one of the Business User's Guide series published by Curtin & London, Inc. The series is addressed to business people who are interested in using the personal computer and popular software as effective tools in understanding their businesses.

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Using Ratios to Measure Condition and Performance

What do ratios reveal about a company's condition or performance? A lot. Used correctly, ratios function like financial investigative reporters, uncovering the real story or "scoop" on a company. They dig deeper than the information provided on a balance sheet or income statement. For example, look at the following income statement on Acme Industries. Would you say that the company is performing well, that Acme is in good shape?

Acme Industries (fictitious company)

Income statement for year ending 12/31/83

Net sales	$1,500,000
Cost of goods sold	750,000
Gross profit	750,000
Operating costs	150,000
Income before taxes	600,000
Taxes (40%)	240,000
Net Income	$ 360,000

As measured by profits, the company's

performance is good. Net income looks all right, given the level of net sales. But ectually, Acme is on the verge of bankruptcy. The company has excessive debts that must be paid soon, and it doesn't have sufficient cash or liquid assets availeble to pay those debts. A lot of income had been invested in essets to support company growth, and present cash balance is barely sufficient to take care of upcoming operating needs. A ratio—cash flow to current portion of long-term debt—might reveal the problem. If the manager of Acme had been tracking this ratio and some others, it's possible that the problem could have been prevented. Acme, although it appears profitable, is not in good shape.

Why, you might ask, didn't the balance sbeet show the problem? The balance sbeet does show assets, liabilities, and equity, and its operating ratios show all line items as percentages of total assets or of total liabilities plus equity. But, in Acme's situation, the long-term debt wes on the balance sheet for a number of years, so the operating ratios of long-term debt to total liabilities plus equity actuelly declined as the firm grew. Management interpreted the decline as e good sign. The income statement and balance sheet indicated a well-managed firm. But the ratio, cash flow to current portion of long-term debt, wbich draws information from both the balance sheet and the income statement, shows a different and risky situation.

Different ratios uncover different facts or tell diverse stories. Therefore, to get the story you want, you have to use the right ratio. In the Acme example, the inventory turnover ratio would not be helpful in identifying the complete extent of the problem. Tbere are numerous ratios that can be constructed. They ere helpful only when they are properly and selectively used. Before calculating a ratio, always ask, "What do I want or need to know about my company?" Then select the ratio that gives you the answer. The question clarifies your reason for evaluating the firm. Without that focus, you might use the wrong ratio to uncover tbe wrong information, certainly e waste of time.

There are three primary reasons for using ratios:

- **To monitor condition and performance.** Ratios help managers keep abreast of what's really going on in their businesses. Tracking a half-dozen or so ratios, on a regular basis, belps managers monitor company performance. Ratios force you to think about where profits come from, what you do with your money (where it's invested), and whether you have a sufficient cash flow on a regular basis.
- **Tn set management goals.** Ratios can be used by managers to set meeningful and realistic goals for their companies. For instance, if the manager of Acme survives the cash crisis, he or she could set the following ratio goals: to meintain a current ratio of 3:1, a debt to equity ratio of 1:1, end a return on assets of 10 percent. (If these goals sound unintelligible to you now, they'll sound like understandable English wben you finish this chapter.)
- **To communicate with nthers.** Ratios are part of the language of business. Lenders, creditors, and investors may all ask about your company's ratios as a means of evaluating your compeny. Since these people aren't with you every day, they need some financial yardstick to gauge your company's progress and prospects. Part of that yardstick is likely to be your ratios. Furthermore, these people have particular questions based upon their own perspectives and their interest in your company. And different questions call for different ratio answers. You, as the manager, have to respond to all of them. A firm grasp of ratios—what they are and what they can do—can belp you communicate effectively with others in business.

Together, these three reasons add up to one more reason for using ratios: to help control your company. When you set target ratio goals, you can track the ratios over time to assess progress toward acbieving the goals. If a ratio is off-track, you regain control by taking the actions necessary to bring the ratio back into line. Although ratios don't provide autometic solutions to financial problems, they are useful tools for measuring and controlling company performance. How you use them determines their real value.

Financial ratios are the tools examined here. Operating ratios are a subset of financial ratios. Some financial ratios compare line items with other line items

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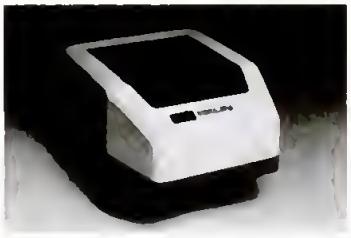

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CIRCLE 215 ON READER SERVICE CARD CALL COLLECT

on the balance sheet, income statement, or both. Because financial ratios show the specific relationship between line items, they can answer a whole new range of business questions for you.

Financial ratios are often grouped into ratio families according to the information they reveal, as shown in Figure 1. Each family has a character of its own, with primary questions that it answers. The individual ratios within a family approach the basic question(s) from slightly different perspectives. The liquidity family, for example, includes two ratios: the current and the quick. Both answer the question, "Can I pay my bills?" We'll examine four families of ratios: liquidity, asset management, safety/leverage, and profitability. Under each family, we've included important and characteristic ratios. The ratio list is not exhaustive, but it is a very useful sample.

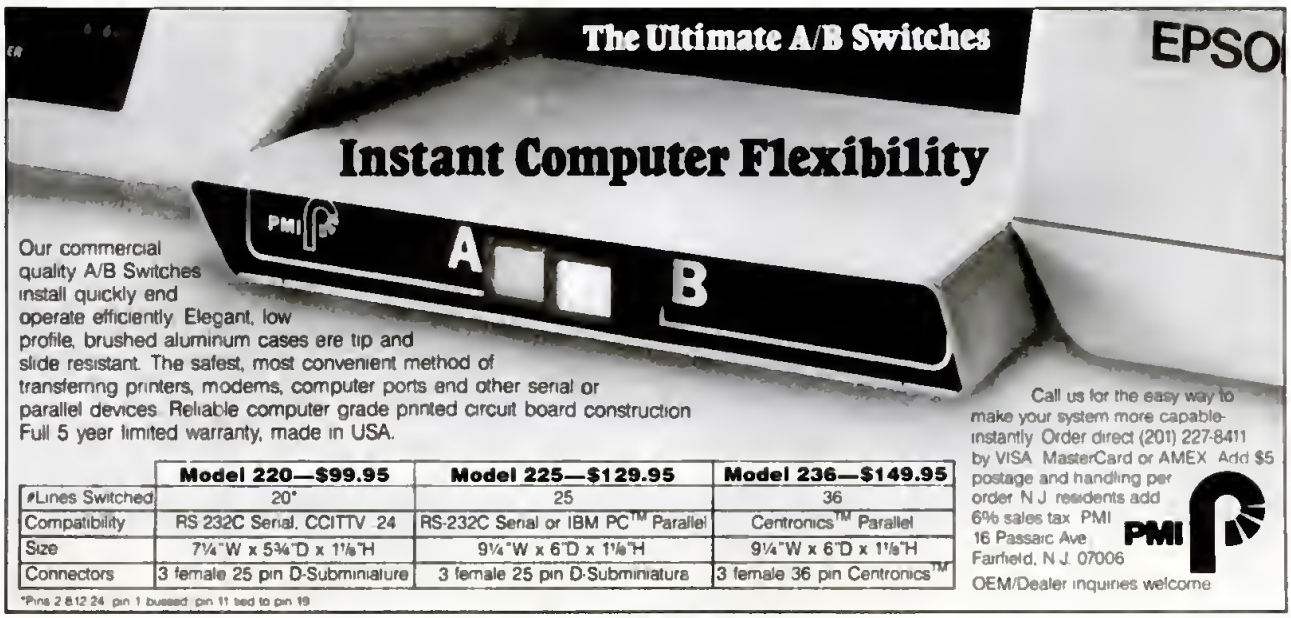
Abraham Lincoln once said, "Better to remain silent and be thought a fool than to speak out and remove all doubt." Too many managers remain silent while bankers or others discuss ratios. These managers are afraid that they'll sound foolish discussing a subject they don't understand. As the ratios are described and explored, you'll see that they aren't complicated, and that you can use them to your advantage.

Liquidity

Liquidity is a company's ability to pay bills as they become due, to meet its short-term obligations. That ability is determined by whether what a firm has in cash and expects to convert to cash (by sale of inventory and/or collection of accounts receivable, for example) is sufficient to pay the debts that are due within a given period of time. This short-term debt-paying ability is of concern to everyone who interacts with a company. In many firms, there are periods when the firm is "illiquid"—unable to pay bills on time. If that situation is infrequent and only temporary, there is usually no problem. After all,

Figure 1: An example of how financial ratios are grouped into families, each with its own characteristics and questions that it answers.

The revealing ratios			
Questions answered	Family of ratios	Ratio	Measure: Condition or performance
Can the company pay its bills?	Liquidity	Current ratio	Condition
		Quick ratio	Condition
How efficiently and productively is the company employing its assets?	Asset management	Average collection period	Performance
		Inventory turnover	Performance
How risky is the business?	Safety/ Leverage	Debt to equity	Condition
		Times interest earned	Performance
Can it cover debts? Can it withstand adversity?		Cash flow/ current portion of long-term debt	Performance
Is the company making enough money? Is the owner's return satisfactory?	Profitability	Profit margin	Performance
		Return on assets	Performance
		Return on equity	Performance



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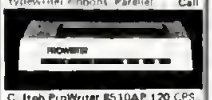

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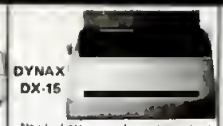

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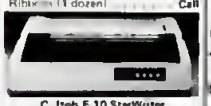

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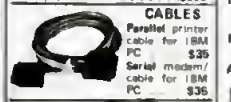

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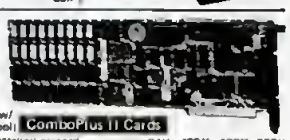

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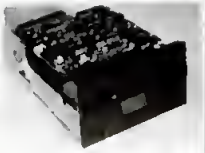

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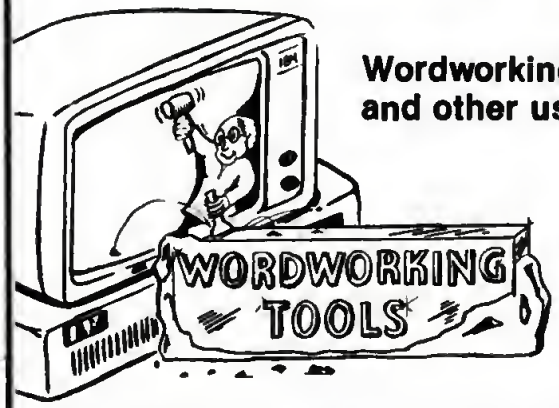

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we all have had that problem at one time or another. But if a firm is illiquid on a regular basis, or for a longer period of time, it is likely to find itself bankrupt.

IF A FIRM is illiquid on a regular basis, or for a longer period of time, it is likely to find itself bankrupt.

Liquidity and profitability ere different. It is possible, and indeed not uncommon, for a firm to be profitable and illiquid et the seme time. But prolonged illiquidity will force a profitable firm into bankruptcy. If e firm cannot pay its short-term bills, it probably cannot pey off long-term debts when they become due. Therefore, liquidity is necessary to evoid financial failure and to allow investors the benefits of profitebility.

To avoid such a crisis, an owner or manager of a company should regularly check the firm's liquidity, by estimeting and monitoring actuel cash flows or by employing liquidity ratios. Both approaches help a manager answer three basic questions about liquidity:

- Is there enough cesh, or expected cash, to meet the needs of the firm for a given period of time?
- Is there enough cesh, or expected cash, to cope with unexpected events?
- Is there enough cash, or expected cash, to take advantage of unforeseen opportunities?

The current and quick ratios, the measures of liquidity expleined in the following peges, can help e meneger essess how well the compeny is prepared for both the expected end unexpected. By using tools such as these retios, the firm's sefety and potential can be increesed.

The Current Ratio

The current ratio was first used to maasure liquidity before 1900, end it is one of the oldest end best-known measures of short-term financial strength. It is e generel test of solvency. The ratio determines whether the current assets (cash or assets expected to be converted to cash within 1 year) are sufficient to cover current liabilities (those obligations thet must be paid within 1 yeer) with a mergin of safety for possible losses, such es inventory shrinkage or uncollectable accounts.

Because this ratio is so widely used by many people, including creditors and lenders, it is importent to understend the informetion it provides. Then you can enticipete how your finenciel decisions are likely to influence the current ratio, and you can make the decisions that affect your liquidity wisely.

Also known as: Current essets to current liabilities; working capital ratio

When to calculate: Monthly

Where to find necessary data: The balance sheet

How to calculate the ratio: Divide current assets (dollar value) by current liebilities (dollar value)

$$\text{Current ratio} = \frac{\text{Currant assets}}{\text{Current liebilities}}$$

Current ossets include cash, marketable securities, eccounts receivable, inventories, and prepaid expenses.

Current liobilities includa accounts payable, short-term loens (or notes payeble), the current portion (thet part which is due for peyment in the next 12 months) of long-term debt, and accrued expenses, if any (usually wages or taxes).

Form of answer: A ratio of e number to 1

Example:

$$\text{Current ratio} = \frac{\$1{,}000{,}000}{\$500{,}000} =$$

2, or 2:1 (2 to 1)

In our example, the current assets are twice es large as current liebilities, so the number given by the formula is 2. The ratio is therefore 2:1. The larger your current assets are in reletion to your current liebilitias, the higher the ratio (3:1, 4:1, etc.).

When current assets are smaller than current liebilities, the answer will be a decimel less then one, but it is still the current retio. For example, if current

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essets ere only helf es lerge es current liebilities, the result of dividing the smeller by the lerger is less then one:

$$\text{Current assets} = \$500{,}000$$
$$\text{Current liabilities} = \$1{,}000{,}000$$
$$\text{Current retio} = \frac{\$500{,}000}{\$1{,}000{,}000} =$$

.50, or .50:1

How to analyze the ratio: A retio showing current essets to be twice es large es current liabilities is generally accepted es indicating solid financial condition. An exception exists wben e mejor part of the current assets is inventory, beceuse inventory is the most difficult to convert to its merket velue in cesh. For exemple, ratios below 2:1 preveil in businesses sucb es the food industry, or in other concerns where there are exceptionally fast turnovers of receivebles and inventories. But in most industries, menegers recognize thet e current retio of less than 2 to 1 is a symptom of possible trouble. It is frequently an outward sign of finenciel stress, e warning signel. A 1:1 retio tells e maneger thet the firm cen just meet upcoming bills, while a 2:1 ratio means there is a financial cushion for any unforeseen events.

THE CURRENT ratio is a general test of solvency.

The current retio should be used with judgment. Sometimes the story it tells is deceptive. A 4:1 retio in e seesonal business might decline to 1.5:1 et the height of the seles season, when inventory decreeses. Conversely, the current ratio could be high because of large amounts of accumuleted unsold inventory. Tberefore, alweys consider bow much inventory is carried over from one seeson to the next. For instance, in the apparel trades you would treck bow many summer dresses are on hend in autumn. A high retio can also result from e buildup of inventories due to felling seles; e low retio can result from temporarily high current liabilities, such as when taxes are due during a period of previously high profits.

Alweys analyze the retio eccording to the unique cherecteristics of your industry. Current retios vary among industries. Consider the "fest food" service and heavy equipment manufecturing companies. Fest food resteurants mey beve decent cesh and cesh flow, but no receivebles and minimel inventory. Most of their essets are fixed, but current bank loans, tredes payeble, and eccruels (all liabilities) could be sizable. Say thet current assets are $100,000, and current liebilities are $150,000. The current retio is then .67:1, which looks dangerously low. In fect, you might conclude thet the business

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cannot meet its future obligations. But fast food businessas may ganerate $3,000 a day in cash, or $90,000 in a month. Add that $90,000 to tha current assets, and you get a total of $190,000. That would improve the current ratio from .67:1 to 1.27:1, a significant changa. Servica companies and heavy equipmant manufacturers are also likely to hava most of their asset investment in fixed assats. Their currant ratios will look waak, but actually tha nature of thasa industrias producas tha low current ratio, and not poor businass management.

THE QUICK ratio is a conservative test of a firm's liquidity.

In looking at the current ratio ovar time, a staady increase would saem idaal. Certainly a 3:1 ratio is better than a 2:1 ratio, or 4:1 better than 3:1. But is a ratio of 20:1 better than 3:1? Is concern warranted if tha monthly ratio fluctuatas from 2.5:1 to 15:1, and back to 2.5:1?

These quastions can only be answered by studying the particular business and analyzing the reasons behind the ratio fluctuations. Comparing the ratio against industry averages may also be helpful. The point to remember in analyzing tha current ratio is that both the information underlying tha ratio and the nature of the businass hava a baaring on tha intarpratation of the ratio.

Viewpoints:

Owner/stockholder. Tha stockholdar of a firm usually prafers a low current ratio to a high ona. Stockholders viaw investment in current assets, particularly cash and accounts receivable, as lass productiva than invastment in equipment or inventory (which can incraase current liabilities through financing). Because owners and stockholders are apt to be primarily concernad with profits and productivity, they usually prafer lowar current assats and higher currant liabilities that give a lower current ratio.

Banker. Liquidity is so important to bankers that it is often incorporated into a loan agreement. Bankers may require a company to keep a minimum lavel of net working capital (current assats minus current liabilitias) or a minimum currant ratio. Bankers look at net working capital and the current ratio over periods of time to determine a company's ability to weather financial crises. A high current ratio means more assets and a greater amount of nat working capital. If either the ratio or net working capital falls below the level stipulatad by tha bank, the loan would be in default.

Like tha owner/stockholder, the lender/creditor is wary of unusually high current ratios (abova the acceptable ranga which is created by industry practices and tha nature of the businass). A vary high ratio could maan that the current assets of a firm are not liquid, that is, aasily convertad into cash. This is a situation that would not plaase a potantial lendar.

In some instances, a banker may not faal that tha current ratio is a sufficiantly accurate measure of a firm's liquidity. This is especially trua for businasses that hava a larga portion of current assets tied up in invantory, which may or may not be salable. In thosa cases, the bankar will usa tha quick (or acid-test) ratio.

Monoger. Tha managar is caught in the middla between tha ownars' and landars' viaws on tha current ratio. Ownars want profitability and a low ratio whila landars want safety and a high ratio. The manager must attempt to satisfy both, whila maintaining adequata working capital and enough liquidity to ensure tha smooth functioning of the firm. The manager's decisions can directly affect tha current ratio, sinca a managar has primary responsibility for financial planning. Managers recognize the need for profits and safaty, and therefore thay oftan aim for a ratio which is neither too high nor too low.

Managars need to exercise caution in maintaining a firm's liquidity ratio. Although liquidity generally reduces risks, and too low a ratio indicatas incraasad risk, too high a ratio indicates unprofitable investmant in current assats. A reasonable ratio usually falls within a ranga datarmined by tha firm's axpariance, or by observing industry averages. If tha current

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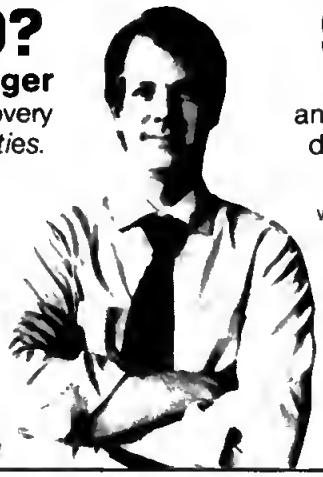

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ratio falls outside of the acceptable range, a manager needs to take actions that will bring the ratio back into line.

DIFFERENT ratios uncover different facts or tell diverse stories.

If your firm's current ratio is too low, ask questions such as thesa:

- Can the company afford to pay some debts?
- Can current assets be increased by obtaining loans with a maturity of more than 1 year?
- Can current assets be increased from new equity contributions?
- Can noncurrent assets be converted to cash?
- Rather than take profits out or declare dividends, can management plow more profits back into the company?

If you determine that the current ratio is too high, ask:

- Is too much cash available, making the business a take-over candidate or subject to IRS review for excess earnings?
- Is accounts receivable high because of liberal credit policies or slow collections?
- Are inventories high because of excess raw material, work in process, or finished goods?
- Are current liabilities very low as a result of not taking advantage of trade credit or short-term bank loans?

A good manager can use the current ratio as a tool in formulating decisions regarding the firm's liquidity.

Adjustments and variations: An odjustment is a change made in the ratio ltself by adjusting the information in the ratio numarator or denominator (usually by adding or subtracting an additional line item). A voriotion is a different ratio but one that is similar to the ratio being discussed.

Thare are no standard adjustments or variations made in calculating the current ratio. It is always total current assets divided by total current liabilities.

The Quick Ratio

The quick ratio is a conservative test of a firm's liquidity. In fact, it is so stringant that it is sometimes cailed the "acid-test" ratio. This nama derives from a fundamental tast of liquidity in the Middle Ages. In those times, paymant was often made in the form of gold or gold coins. To insure that payment was good—real gold—acid was applied to the coins. If the test was positive, the gold was good and payment was accepted. The acid test was foolproof. Although people today don't apply acid to coins or to a firm's books to assess payment, thay do apply the acid-test ratio. Like its early forebear, this ratio measures true paymant potential, or the ability of a firm to meet its short-term obligations.

Why, you might ask, is the quick ratio considered the real "acid test" of liquidity and not the current ratio? Don't both examine the relationship between current assets and liabilities? They do; the answer lies in inventory. The quick ratio is a more stringent test than the current ratio because it does not include inventory in its formuia, while the current ratio does. Inventory is the least liquid current asset. It represents goods which are not yet sold; goods which could be unsalable, salable only at a discount, or even become obsolete with age (or the development of new technology). Therefore, by removing inventories from the formula, the quick ratio concentrates on the really liquid assets, whare valuas are fairly certain. It helps to answer the question, "If all sales revenue should disappear, could my business meet its current obligations with the readily convertible 'quick' funds on hand?"

Also known as: Acid-test ratio

When to calculate: Monthly

Where to find data: The balance sheet

How to calculate: The quick ratio is the firm's "quick assets" divided by current liabilities.

$$\text{Quick ratio} = \frac{\text{Cash + Marketable securities + Accounts receivable}}{\text{Current liabilities}}$$

or: $\frac{\text{Current assets - inventory}}{\text{Current liabilities}}$

Quick ossets include cash, marketabla

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securities, and trade receivables. Inventory is left out for the reasons outlined above. Prepaid expenses are also not considered since they will not be converted to cash at any time. (If one of your notes receivable is a loan to management or a stockholder, it should not be included.)

Current liabilities are made up of accounts payable, notes payable (loans due within 1 year or loans due upon demand), accrued expenses (such as taxes and wages), and any long-term debt payment due within the next 12 months.

Form of answer: A ratio of a number to 1. The ratio shows the number of times the most liquid assets will cover current liabilities: 1.17 times in the following example:

Example:

$$\text{Quick ratio} = \frac{30{,}000 + 40{,}000}{60{,}000} =$$

1.17, or 1.17 to 1

How to analyze: For manufacturers, a quick ratio of 1:1 is considered acceptable. Retail, wholesale, and service firms will usually have a quick ratio less than 1:1. Again, there are numerous exceptions depending on the industry.

A general feeling about the quick ratio (and also the current ratio) is that the higher the ratio, the better. That may be true from your creditors' point of view, because creditors stress prudence and safety. But you, as an owner or manager, should aim to keep your business strong and trim, rather than fat. Idle cash balances and receivables out of proportion to your selling needs should be reduced. The key to successful financial management is to conserve the resources of your business and to make those resources work hard for you. Therefore, you want a healthy quick ratio, but not an inflated one (too high).

Remember that the quick ratio is a measure of liquidity, but it does not tell you exactly how liquid your current assets are. That could only be determined by actually converting the assets to cash. The ratio is a general indication of your firm's ability to meet maturing obligations if its assets, excluding inventory and prepaid expenses, were to be converted to cash. There can always be a difference between the projected value and the real cash value of assets.

YOU WANT a healthy quick ratio, but not an inflated one.

Viewpoints: The viewpoints of own… stockholder, banker, and … the quick ratio are esse… their viewpoints towa… described previously…

Adjustments …

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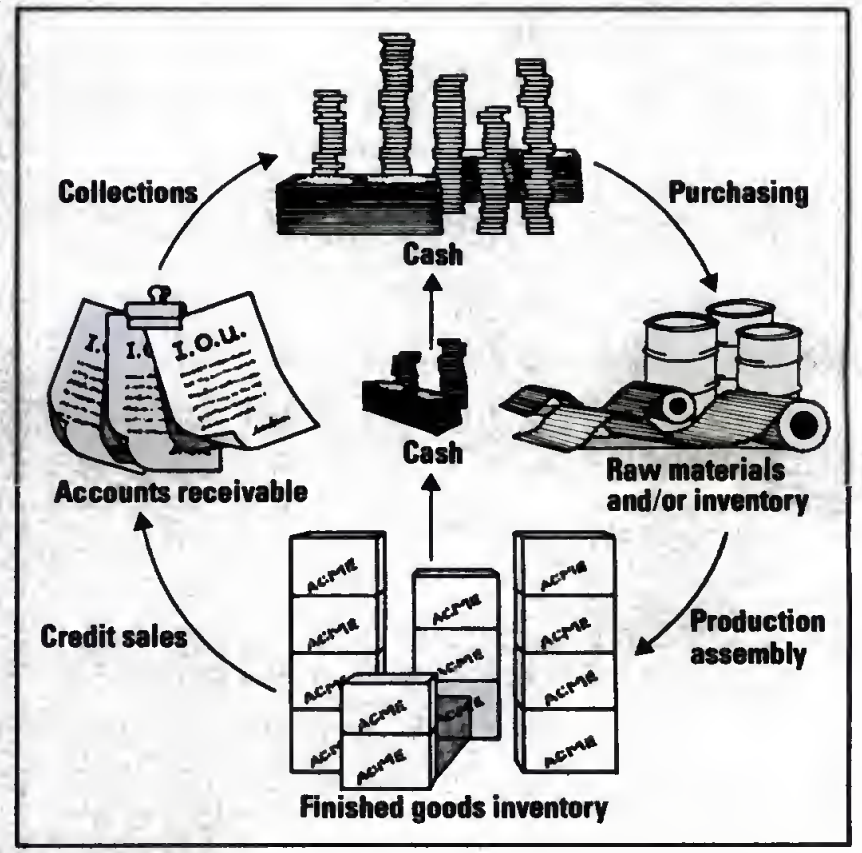
known es asset efficiency retios, can help you answer these questions. The value of the questions is obvious; since assets ara one of your company's basic resources, you want to assure that they are being employed efficiently and productively. It takas capital to finance assets, and esset management ratios can give you an indication of whether your company is overinvested or underinvested in the various assets.

Generally, you want to keep your assets and cash working for the company to produce profits. One useful way of looking at that mission is called the *cosh cycle* or *cash wheel* (see Figure 2).

The cash whaal starts at cosh. Cash is used either to buy goods for sale (inventory in s retail business) or to maka goods for sale (finished goods convertad from raw materials in a manufacturing business). Either way, some cash becomes invested in inventory, the goods to be sold. When those goods are sold on credit to a customer, an account receivable is creeted. Cash is due back into the company, and when the receiveble is collected, that cash (prefarably your cost of providing the good or service plus profit) is put back into the cash wheel. The cash is ready to be used again, and if it includes e profit, there is more cash fad into the cycle.

The objactiva is to speed up the spinning of the cash wheel, thus managing assets efficiently. This can be done by incraasing sales while maintaining tha same level of inventory and receiveblas, or by reducing inventory and receivablas while maintaining e constant level of sales. Either approach keeps the cash wheel moving and working. Nota that cash, in the wheel, is held up in inventory and receivables. The longer it stays in these asset forms, the slower the wheel turns. When inventory and receivables become too much of a drag on the wheel,

Figure 2: A useful way of seeing if your assets are being monaged efficiently is the cash wheel.



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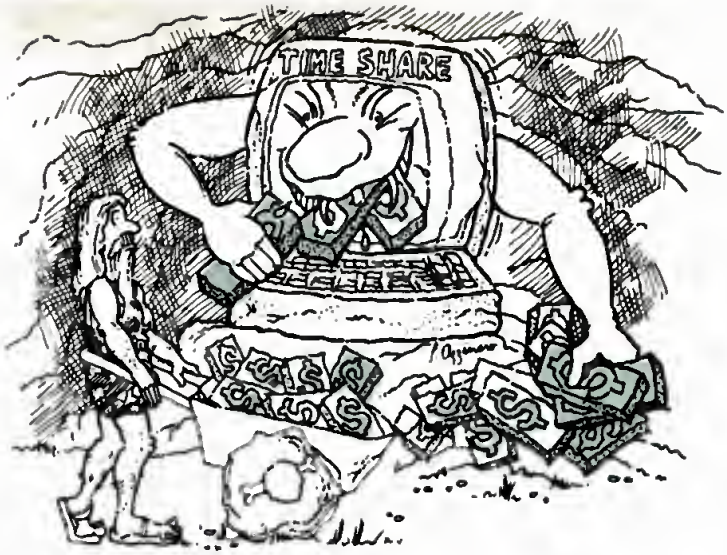

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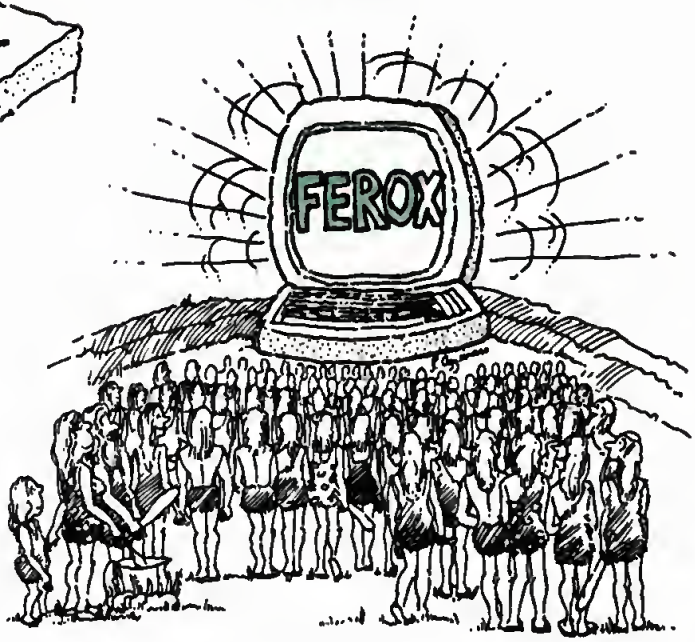

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management action measures to reduce that braking effect need to be taken. For example, you could stop selling to slow-paying customers (reducing receivebles time) or stop carrying slow-moving items (reducing inventory).

But spinning the cash wheel too fest can cause problems. You can't cut receivables and inventory to zero in your efforts to spin the wheel. Credit sales and receivables are necessary for most firms to remain competitive. Inventory is required to avoid stock out problems. There will always be pockets of cash tied up by your investment in accounts receivable and inventory. The objective of asset management involves not only efficient end effective cash management (the cash wheel), but ensuring that there is sufficient investment in your working capitel assets to remain competitive.

Asset management ratios provide a wey of examining the entire cash wheel, because they examine the level of a company's investment in current essets in relationship to the level of thet company's operations, or sales. Like ell ratios, they piece together information. In this case, the level-of-investment figures are taken from a company's balance sheet and the level-of-operations figures (usually in the form of net seles or cost of goods sold) are teken from the income statement. The ratios put the figures together in a meaningful way.

SPINNING the cash wheel too fast can cause problems.

Two asset management ratios are covered: an inventory turnover and the average collection period. Inventory turnover measures how often an asset, such as inventory, "turns over" or moves through the business during a period of time, such as a month or yeer. it elso tells you how long you are tying up cash in thet esset before it sells. The average collection period ratio measures how long cash is tied up in the sale before it is converted into cash. Both of these forms of esset management ratios are useful to management. By watching them over a period of time, managers can spot trends or potentiel problem areas, and then take corrective action.

Average Collection Period

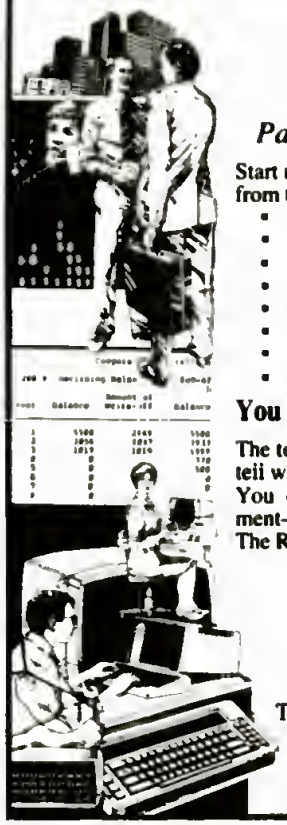
The average collection period represents the average length of time a firm's eccounts receiveble are outstanding—or the average iength of time between when a credit sale takes place end cash from the sale is ectually received. In todey's credit economy, very few firms can avoid selling on credit. These credit sales create eccounts receiveble, which are shown as a current asset on the balance sheet. They represent future cash inflows to the business.

The level of accounts receiveble that you meintain on your balance sheet is directly releted to your level of credit sales and the seasonality of sales. The eccounts receiveble balance is also affected by other management areas, including sales volume, credit policy and credit terms offered, end collection practice. Seles volume creetes eccounts receivable. Credit poiicy refers to the means you use to evaluate potentiel credit customers and determine which ones receive credit and which ones don't. The credit terms (such as discounts or net 30) you extend to customers elso effects the level of receivebles. Generally, credit terms outline how long customers have to pay and whether any discounts are eveilable. They are usually determined by prevailing industry practices. Your collection practices, or how vigorously you pursue late-paying customers, also partially determine how fast customers pay you. All these factors—credit sales, policy and terms, and collection practices—affect the average collection period.

The average collection period, then, indicates the quality of your customers (how well your credit policy works), how effective your credit terms are, and whether the collection department is performing at an acceptable level.

Also known as: Collection period retio; everage coilection period of receivables; days receivables

When to calculate: Monthly or yearly



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CIRCLE 231 ON READER SERVICE CARD

Where to find data: Credit sales is found on the income statement; receivebles is found on the balance sheet.

How to calculate: Accounts receivable is divided by averege seles per dey:

Step 1: Deily credit seles =

$$\frac{\text{Credit sales}}{\text{\# days in period}}$$

Step 2: Averege coll. per. =

$$\frac{\text{Receivebles}}{\text{Daily credit sales}}$$

Credit soles is used in the numeretor of the receivable turnover. To be eccurete in your calculetions, you can only use that part of seles activity which creates the accounts receivebie, which is credit seles, not net sales.

Receivobles should include all accounts receivebie and notes receivable thet arise from credit sales, less your allowance for bad debts. This means that if e note receivebie from a meneger or stockholder is included in receivables, it should be subtracted out before the calculations are performed.

Form of answer: Deys

Example: (*Note:* Since our semple lncome stetement and balance sheet are for a full year, this is the formula for a yearly ratio.)

$$\text{Deily credit sales} = \frac{300{,}000}{365} = 821.92$$

$$\text{ACP} = \frac{40{,}000}{821.92} = 49 \text{ deys}$$

The retio shows the averege number of deys it takes a company to collect its receivebles, or the everage days between credit sales and receipt of cash payment for those sales. In this case, the everage customer peys you 49 days after e credit sale.

How to analyze the result: The general rule of thumb is that the average collection period should not exceed 1.3 times the credit period you extend to customers. So if the credit period is 30 days, the average collection period should be no more than 39 days (30 × 1.3). If the collection period is too high, you may be extending credit to customers who are not creditworthy. If this is the case, their bed debts mey build up and reduce your profitability. A high collection period may also indicate lex collection prectices, e no-discount policy, or e large number of alternetive suppliers for your customers. Also, if one or two

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customers account for a large portion of your credit sales, they can cause your average collection period to change dramatically, according to when they pay. On the other hand, if the collection period is too low, you may be too careful in extending credit. In this case, you may be turning away cuatomers who would pay and add to your profits.

One of the major problems in amall firms is that they frequently don't write off bad debts in a systematic manner. If the balance sheet carries accounts receivable with no allowance for bad debts, then the average collection period is going to be slightly higher than it would be if the firm took action on customers who don't pay. One way to check the aituation is through the oging of receivobles method. You list how many of your receivables have been due for over 30 daya, 60 days, 90 days, and so forth. Then, depending upon your type of business and the standard credit terms offered by others in your industry, you can target a certain level of receivables for attention and possible elimination.

Viewpoints: Everyone (except your customers) looks for the same thing: a fairly low average collection period.

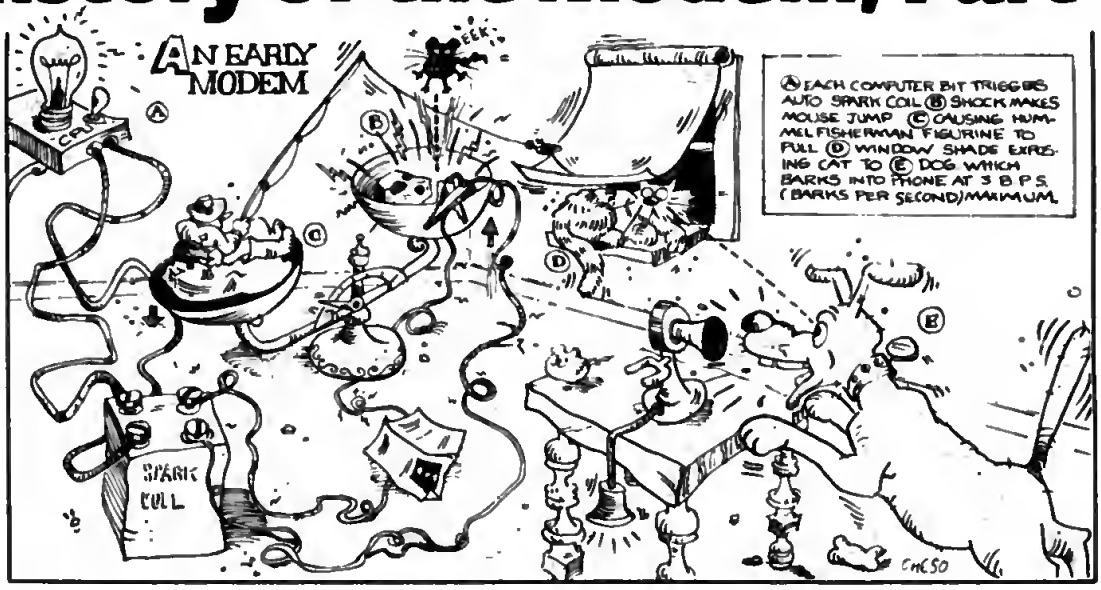
Owner / stockholder. Stockholders want the business to produce as high a level of sales and profits as possible. At the same time, they prefer a low investment in accounts receivable and therefore a low average collection period. These two objectives conflict. Pushing for higher sales introduces the riak of taking on lesa creditworthy customers and creating bad debts. Pursuing vigorous collection on receivables to keep the receivables investment low is likely to discourage customers from buying from you. So a balance between the two objectives must be reached. You should be willing to take on less creditworthy customers (to create higher sales) up to the point where the bad debt and additional collection costs exceed the additional profits you earn by selling to these customers.

EVERYONE (except your customers) looks for the same thing: a fairly low average collection period.

Banker. The average collection period is an indication to a banker of how well you're managing the firm's assets, and bow quickly you're able to get casb from credit salea back into the business. Bankers, then, are interested in the average collection period, but are not quite as interested aa the owner or manager.

Manoger. The manager wants to keep a low collection period but must exercise judgment about the best way to do that. The manager haa to maintain the firm's cash flow, so he or she must weigh the effect of giving up lesa creditworthy sales

History of the Modem, Part 1



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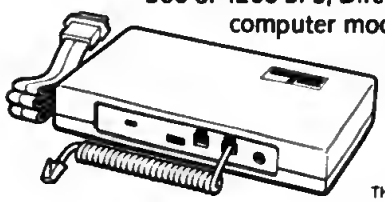

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CIRCLE 104 ON READER SERVICE CARD

against the possible cash to be gainad from thosa sales (even if it takes 90 deys to collect). Tha managar must find the workabla receivables level for tha salas level, and then determine e reasonable range for the average collection pariod. Credit policies and terms and collection practicas can then be used by the managar to alter the everage collection period. The manager must also remember that a decrease in the average collection period brings a cash infusion into tha company, but only once per decrease. For exampla, if you heve an average collection period of 50 deys for a given level of sales and you reduca the period by 10 days, you've made 10 deys of credit sales in the form of cash available. But this won't be repaatad in tha naxt collection period unlass you achiave a further decrease.

Adjustments and variations: There are saveral adjustments to and variations of the avarage collection pariod. Ramamber that en adjustment is a change made in the retio itself by edjusting the information in the ratio numeretor or denominetor. A verietion is e different ratio but ona which is similar to the ratio being discussed.

Monthly odjustment. Most books on ratio anelysis suggast using a full year—365 or 360 days—to detarmine the averege collection period. Howevar, if you wait until the end of the year to evaluate the everage collection period, it may be too late to taka correctiva action. So monthly calculetion of the everage collection period is prefarred. To obtain a monthly ratio, calculete daily credit sales using tha month's sales and 30 as the number of days in the month. The formula is then:

$$\text{Daily credit sales} = \frac{\text{Credit sales}}{30}$$

$$\text{Avarage collection pariod} = \frac{\text{Receivables}}{\text{Daily credit sales}}$$

For example,

$$\text{Daily credit salas} = \frac{\$25{,}000}{30} = 833$$

$$\text{Avaraga collection period} = \frac{\$40{,}000}{833} = 48 \text{ days}$$

Monthly ratios ara particularly usaful in detarmining seasonal collection pettarns, so that managars can anticipata possible cash flow problems.

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Average accounts receivable variations. Another common variation uses average accounts receivable instead of the month-end or year-end balance. To get average receivables, you simply take the last period's balance plus the current receivables, and divide this sum by 2. When you perform this adjustment on monthly collection periods, it will tend to smooth out seasonal fluctuations. Therefore, it is not recommended for internal management purposes. If, however, you are approaching a lender for a loan and you have experienced a large increase in sales over the last year, this adjustment may be appropriate. When sales increase, accounts receivable also increases, unless there has been a shift in the ratio of credit to cash sales. This means that the higher level of sales at the end of the period will produce a higher receivables balance. Since receivables represent your more recent credit sales and annual sales show the total sales without depicting the increase throughout the year, your receivables will actually be high in relation to total annual sales. Using average receivables more fairly represents your actual financial position in this case.

Inventory Turnover

Inventory is a critical area for many businesses. It can account for more than half of many small manufacturing and retailing firms' total asset investment.

A HIGH ratio could indicate possible stockout problems.

And, for most firms outside the service segment, it can account for half the current assets. Equally important, inventory is very sensitive to changes in business activity within the overall economy, the industry, or the individual firm. Inventory is also costly to carry and is a risky asset if you are in a business that is exposed to frequent obsolescence or style changes.

Inventory turnover, as a ratio, shows how fast your inventory or merchandise is moving. This ratio helps answer the question, "How efficiently and productively am I employing the company's assets?" This is why it is an asset management ratio.

Inventory management can be evaluated on the basis of the number of times inventory is turned over during a period, or by how many days' inventory the firm maintains at a given point in time. For overall management purposes, turnover is often used. When inventory is broken down by product or into raw material, work in process, and finished goods groups, both approaches (turnover and days inventory) are common.

Also known as: Stock turn; stock to sales

When to calculate: Monthly (Inventory turnover should be calculated monthly because the seasonal nature of most small businesses puts pressure on cash flow through inventory requirements, and frequent monitoring helps in planning.)

Where to find data: Cost of goods sold is found on the income statement; inventory is found on the balance sheet.

How to calculate: Divide cost of goods sold by inventory:

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Inventory}}$$

Cost of goods sold is the expense item which includes the purchase price of stock in a retail business, or total costs of goods for sale in a manufacturing firm (raw materials, labor, and overhead).

Inventory is the dollar amount on the balance sheet.

Form of answer: Times (that inventory turns over)

Example: (Based on the annual statements used in this book.)

$$\text{Inventory turnover} = \frac{180{,}000}{60{,}000} = 3 \text{ times}$$

This means that the company "turned" its inventories 3 times during the year—that is, it used up, through operations, merchandise or inventory totaling 3 times its average inventory investment. Another way of stating this is that the average inventory investment moved through the business (was bought and sold) three times during the year.

How to analyze the result: Usually, the higher the turnover, the better. A high turnover means that your company has been able to operate with a relatively small investment in inventory. It may also suggest that your inventories are current and salable; that, since they have not been on the shelves too long, they probably contain few unusable items. But almost anything can be overemphasized, and inventory turnover is no exception. You should carefully analyze the inventory turnover ratio. For example, a high ratio could indicate possible stockout problems. There are two forms of stockout. The

INVENTORY turnover is a much better management guide than the absolute size of the inventories.

first occurs when you do not have the goods a customer wants to buy. That can lead to customer dissatisfaction or lost revenue and profit when the customer goes to a competitor for the purchase. The second type of stockout occurs when production of goods is disrupted because of a lack of raw material inventory. Both forms of stockout can be costly. What, then, should your inventory turnover be? The desirable rate depends on your line of business, level of business activity (sales volume), method of valuing inventories, captial used to support inventory, and various trends. A study of the turnover rates of business similar to yours can help you answer the question. But remember that firms value inventory in different ways, and this affects their inventory turnover ratios. Keep valuation methods in mind when you compare your firm's turnover rate with that of others.

Inventory turnover is a much better management guide than the absolute size of the inventories. Size can be misleading. An increase in inventories, for instance, may represent the addition of stocks to support growing sales. But it also might mean that merchandise is accumulating because sales have slowed down. In the first case, the inventory turnover remains the same or even increases; in the second case, it declines. Thus, if inventories begin to grow proportionately faster than sales, a declining turnover rate will warn the alert small business owner-manager that trouble is brewing. If inventories are increas-

ing for sound reasons, the turnover will remain the same or improve.

Viewpoints: Nearly everyone evaluating your inventory menagement using turnover prefers a high ratio to a low one. The owner/stockholder, banker, and manager all view a high inventory turnover favorably, as long as stockouts are evoided.

But inventory turnover may be difficult to assess accurately from a position outside the firm. Outsiders do not have access to all the firm's operational and financial date, so they rely on the financial statements, which end on a specific dete. Internal firm management can influence that dete, and therefore the numbers. Also, many small firms attempt to minimize their tax liability by reducing inventory at the end of the tax period. They do this by pushing sales and delivery, while delaying inventory replenishment. Thus, inventories decrease, pushing up cost of goods sold. The result is a higher inventory turnover ratio, and one that probably does not fairly represent inventory turnover the rest of the year.

Adjustments and variations: Average inventory odjustment. If your firm is experiencing even moderate growth, using the year-end inventory figure from the balance sheet may be misleading. It will produce a lower turnover rete than the one you actually experienced. The reason for this is that the cost of goods sold increases over the year and is cumulative, while the inventory is taken at a point in time. Since the level of inventory you maintain is a function of your current level of operations (sales), growth in sales will require a higher level of inventory at the end of the period than at the beginning. Therefore, it is adviseble to use the everage inventory for the period. The formulas to find everage inventory turnover are as follows:

$$\text{Average inventory} = \frac{\text{Beginning inventory} + \text{Ending inventory}}{2}$$

$$\text{Inventory turnover} = \frac{\text{Cost of goods sold}}{\text{Average inventory}}$$

Sales voriotion. This varietion of inventory turnover is found by the following formula:

$$\text{Inventory turnover} = \frac{\text{Sales}}{\text{Inventory}}$$

Some people use sales as the numera-

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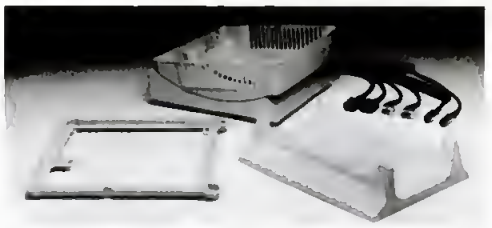

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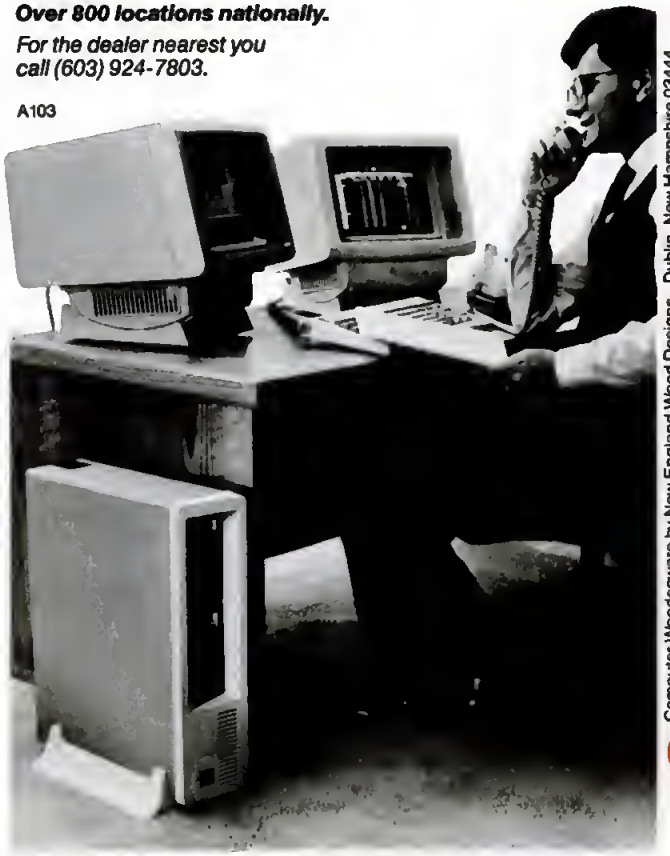

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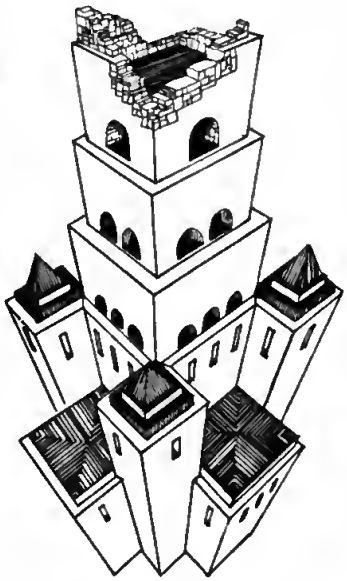

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tor In the formule insteed of cost of goods sold, which can be misleading. Sales revenue is determined by the number of units sold and the price per unit. The cost per unit is very different from the selling price of each unit. Since most firms carry inventory on the balance sheet on e cost basis, it is more eppropriate to use cost of goods sold than sales when determining inventory turnover.

This sales varietion is frequently used by retailers instead of the basic inventory turnover ratio. Retailers frequently velue inventory et reteil price. Therefore, they want to compare inventory with sales, not cost of goods.

Days inventory voriotion. The method for finding this variation is:

$$\text{Days inventory} = \frac{\text{Inventory}}{\text{Sales/365}} = \frac{\text{Inventory}}{\text{Average daily sales}}$$

$$\text{or} = \frac{\text{Inventory}}{\text{Cost of goods sold/365}} = \frac{\text{Inventory}}{\text{Average daily cost of goods sold}}$$

Days inventory represents the length of time you can go without replenishing inventory, or the everege length of time capitel is tied up in (invested in) inventory. Many manufecturing firms use this ratio to set safety stock levels, so that disruptions in supply will not shut down production. Retailers end wholesalers also set stock levels based on days inventory for the same reason. For example, day's inventory of 49 means that you can go 49 days (from the date on which the ratio was calculated) before you run out of inventory. Deys inventory is usually calculated weekly or monthly.

Inventory turnover by product varietion. Inventory turnover records for individual items, groups of products, end product lines are elso helpful, especially for retailers and wholesalers. They show which items are selling well and which are slow-moving. Such turnovers should be prepared monthly or, for products that are perishable or become obsolete quickly, on e perpetual or deily basis. This enables you to reorder fest-moving items in plenty of time and to prepare to dispose of slow-moving items before their value depreciet-es too far.

You can use the basic inventory turnover ratio or its edjustments and varietions to track inventory turnover by prod-

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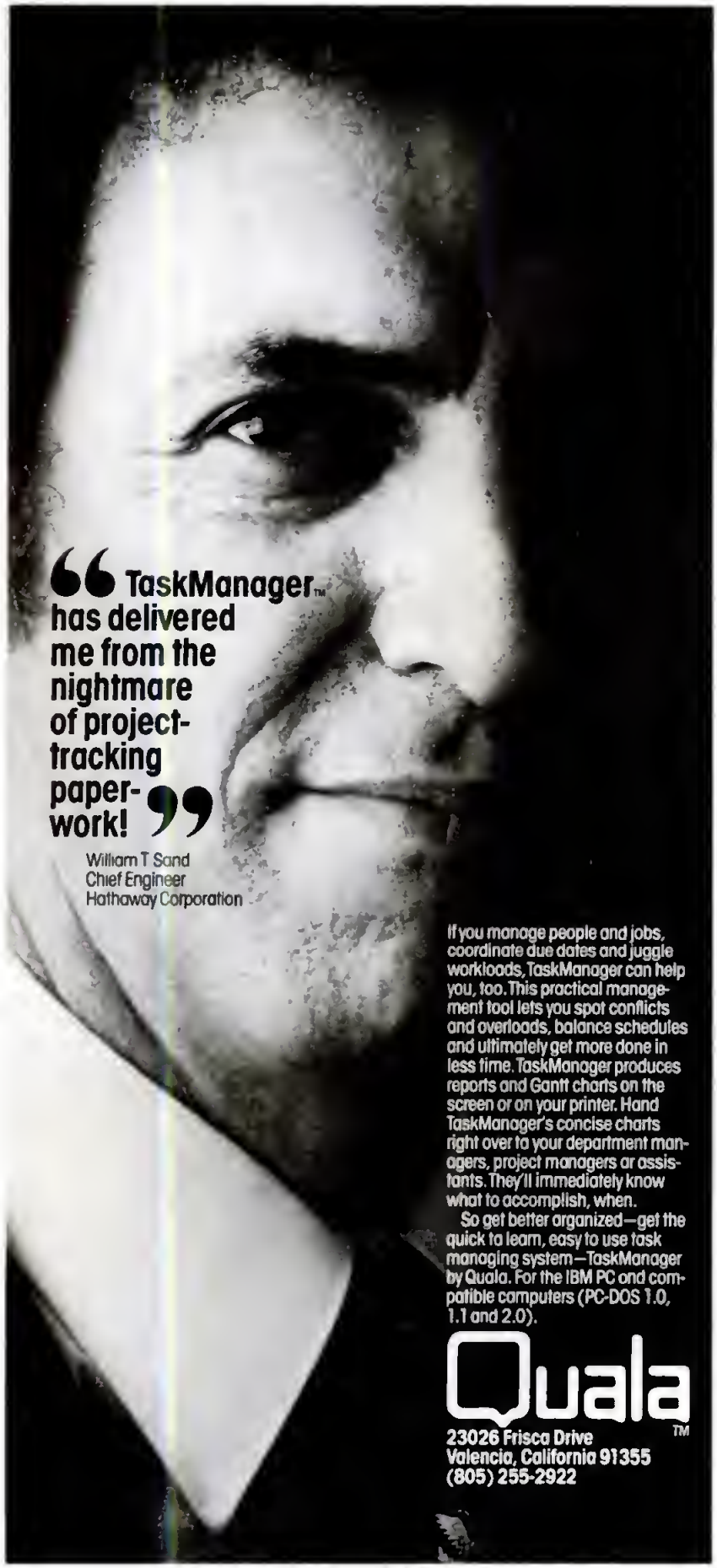

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uct. Your accountant could suggest the most useful ona for your business.

Safety/Leverage Ratios

Safaty or leverege ratios measure a company's ability to meet its short- and long-tarm debt obligetions, and how much

OBVIOUSLY, you are more prudent if your own money is at stake.

of tha company's assets are financed with debt. They reveal the equity cushion that is evailable to absorb any losses that may occur. These retios are especially important to creditors or lenders outsida the firm. Most outsiders are risk averters; thet is, they would prefer less risk to more risk. To them, the safety retios show the company's financial ability to weather a storm; they feel strong retios reduce their risk position. The retios also measure the amount of outside investment compared to ownar or stockholdar invastment.

Owners also want to reduce their risk position. As en owner, you would rether use other people's money to generete profits for yourself. This is where tha term *leverage* comes in. By substituting debt dollars (outsiders' monay) for equity dollars (your money), you mey make more money per dollar you invast than if you provide ell the financing. So you laverage your invastment with financing, usually in the form of a debt, fram someona alsa. You give tham some of the risk of your businass.

Meenwhile, lenders or creditors ere still concerned with the safety of their loans. Thay prefar that owners provide more financing for two reasons. First, owner financing indicates commitment to the business. Obviously, you are more careful end prudant if your own monay is at stake. Second, the lower the level of outside debt, the less company earnings must be used to support interest payments and principal repayment. Therefore, lenders want e higher emount of owner investment. In the end, both want to reduce risk end increase gain, and both heve to nego-

tiate the best financing.

This family of retios, then, can be viewed as a safety or leverege, depending upon your perspective. What an owner calls e leverage ratio, e lender may call a safety ratio. Safety ratios that indicate low risk make the lender more comfortable because they reassure him that he'll be able to "get out whole," should disaster strike the company. The owner generally prefers leverage ratios that reveal higher risk.

Three common safety/leverage ratios will be explained and explored in this chepter. They are debt to worth (equity), times interest earned, and cash flow to current portion of long-term debt. As you'll see, all of these ratios are importent in monitoring a company's performance.

Debt To Worth (Equity)

Debt to worth is one of the most common safety or leverage ratios. It shows how much debt a firm has relative to its net worth or equity. To the experienced analyst, this ratio is an indication of a company's ability to withstand adversity and meet its short- and long-term debt obligations.

It is important for the owner or maneger of a firm to understand this ratio, because most lenders and creditors use it to geuge the overall riskiness of a business. Lenders think of debt to worth in the same way as a golf score—the lower, the better. A debt to worth ratio that is too

WHAT AN owner calls a leverage ratio, a lender may call a safety ratio.

high my limit your access to bank loans and supplier credit.

Also known as: Debt to equity; debt ratio

When to calculate: The debt to worth ratio should be calculated quarterly and annually. In very seasonal businesses, monthly computation is useful.

Where to find data: The balance sheet

How to calculate: Total liabilities are

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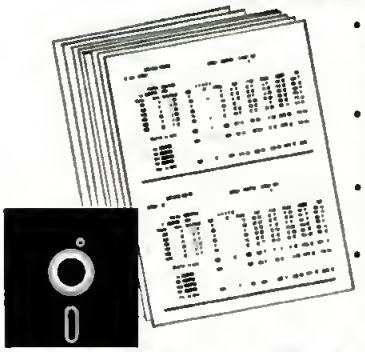

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divided by net worth, or total owner equity:

$$\text{Debt to worth} = \frac{\text{Total liabilities}}{\text{Total owner equity}}$$

Total liabilities here means all debt: all current liabilities as well as long-term debt such as bonds and mortgages.

Net worth, or equity, includes all stock, paid in capital, and retained earnings. It may also include preferred stock.

Form of answer: A ratio of a number to 1

Example:

$$\text{Debt to worth} = \frac{100{,}000}{130{,}000} =$$

.77 or .77 to 1

The ratio shows how many dollars of debt there are for every dollar of equity or net worth; here, there is $.77 of debt for every dollar of equity.

How to analyze the result: From an outsider's viewpoint, the general rule of thumb is that a business should maintain a one-to-one debt to worth ratio. Nevertheless, your type of business, the seasonality of sales and collections, and the length of time you have been in business will all have a bearing on the appropriate mix between debt and equity. The more stable your business and the longer you have been in operation (which should mean a higher retained earnings cushion), the higher the debt to worth ratio can be without increasing the riskiness of your company. For example, utility companies have been able to operate with relatively high debt to worth ratios (3 or 4 to 1) because their revenues and cash flows are very predictable and stable.

Viewpoints:

Owner/stockholder. These people typically prefer a high relative debt position; that is, a high debt to worth ratio. Their goal is to "leverage" their investment with the money of others, who will be paid a known return in the form of interest, into profits for themselves. Here's an example of leverage.

Assume that your total assets are $100 and you expect to earn $50 before interest expense and taxes. Interest will be 20 percent on debt. Further assume that you can pay for your assets with any combination of liabilities (debt) and equity. What will be the difference between a high debt to worth ratio and a low one?

Figure 3 seems to indicate that the higher the relative debt, the lower the profits. This is certainly true. But, for each dollar of equity you as the owner invest, you actually earn more with the high debt to worth ratio. With the figures above, you'd earn $1.70 for every dollar of the $20 you invest ($34 divided by $20), while the lower debt to worth ratio gives you $.58 for each dollar of the $80 you invest ($48 divided by $80). Stockholders generally prefer high debt to worth ratios. But there are limits. If debt reaches too high a level, it can place excessive strain on the company's ability to meet interest and repayment requirements. When this occurs, there is a question about whether the company will be earning profit which investors (stockholders) ultimately expect to be theirs.

	(Borrow funds) High debt/worth (4:1)	Low debt/worth (1 4) (Stockholder investment)
Debt	$80	$20
Equity	20	80
Earnings before interest and taxes	50	50
—Interest (20%)	16	4
Before tax profit	34	46
Return on equity	170%	58%

Banker. Bankers recognize the importance of debt to owners. It is equally important that borrowers understand the objectives of the bank. A bank's first and most important objective is to protect the money depositors entrust to the bank. This is a rather large responsibility, and the reason why most bankers are considered conservative. Only after a bank is sure that its depositors are protected will it consider the potential profit from lending or investing. This means that the terms of a loan are secondary to the lender's belief that the loan will be a good one. It is why, for weaker customers, banks insist on collateral, higher interest rates, shorter maturities, personal guarantees, and so forth. It is little wonder that banks prefer lower debt to worth.

A BANK'S first and most important objective is to protect the money depositors entrust to the bank.

Manager. Again, the manager is caught in the middle trying to please both stockholders and lenders. The primary concern for the manager should be whether sufficient cash flow is being generated; whether enough cash is on hand to meet interest payments and principal repayments, as well as other obligations as they become due.

Since a manager is usually the person to approach lenders for loans, she or he needs to know how lenders evaluate potential customers. A reasonable debt to worth ratio is one criterion, but it is frequently only a starting point for further evaluation.

Keep in mind the maxim, "It is easier to borrow when you do not need the money than when you need it desperately." That means you should approach your banker before your needs are pressing. Think ahead and plan for your capital needs.

Adjustments and variations: The simple debt to worth ratio has a number of adjustments and variations. Most people evaluating your firm will make certain ratio adjustments to get a clearer picture of the firm's situation. Knowing these variations and adjustments, you'll be better prepared to discuss your business with them.

Intangible assets adjustment. One of the most common adjustments is to "back out" or subtract the value of intangible assets from equity. Intangible assets are those which are nonphysical in nature, such as goodwill, patents, or leasehold improvements. For small firms that don't own facilities, or firms in the engineering or research and development (R & D) fields, this adjustment can have a significant bearing. In our example, if the debt to worth ratio is adjusted for intangibles (other assets), it increases from .76:1 to .83:1.

Notes poyoble odjustment. Another adjustment outsiders will meke, perticularly in tha case of small or closely-beld compenies, is to remova (or subordinata) notes peyeble held by stockholders or ownars from the total liabilities. It is fairly common for owners to lend their own monay to tha business on an unsecured basis. Thesa owner loens are subordineted loans, which means that any landar with e higher claim on assets will be paid before the owner. Therefore, a lender or creditor will regard the owner loans as an owner (equity) invastment. So removing or subordineting owner loens to the business decreases the total liabilitias by the emount of the loens and, at the same time, increasas equity by tha seme amount.

In our example, the notes peyable edjustmant causes tha dabt to worth retio to decreasa from .76:1 to .64:1. Obviously, this edjustment improvas e banker's safety position. If, as en ownar, you meke loans to your business, it may ba to your edvantaga to maka this adjustment in the debt to worth ratio and point it out to your banker.

Hidden ossets odjustments. A final adjustment to be considered involvas "hidden assets." Hidden assets are those with e merket velue clearly higher than tha value at which they are carried on e belence sheet. These assets are typically buildings or other facilities listed at a depreciated value for accounting and tax purposes. The bidden esset adjustment is calculated by

$$\text{Debt to worth} = \frac{\text{Total liabilities}}{\text{Total equity + Hidden essets}}$$

In our exampla, assume thet the eppreised market velue of totel fixed assets is $180,000, wbila the valua on tha books (at cost lass accumulated dapreciation) is $80,000. Since totel essets must equel total liebilities plus total equity for the balance sheet to balance, total equity must increase by the value of the hidden essats, or $100,000 ($180,000 – $80,000). The hidden assets adjustment causes the debt to worth ratio to decline to .43:1 from .73:1.

Adding or noting biddan assats is obviously to your advantaga when you daal with a bankar, but you sbould first obtain a professional appraisal to substantiate the higher esset velue.

Thesa threa adjustmants ere fairly common. While tha intangible assets edjustment works to your disadvantage (i.e., it increases your dabt/worth ratio), the othar two actuelly improve your company's safety position from the creditor's and banker's perspectives.

There are elso e number of variations of the debt to worth ratio. Generally, they ellow you to view your levarage position in slightly different ways, end edd information thet is useful from both the owner/manager's and banker's viawpoints.

IT IS easier to borrow when you do not need the money than when you need it desperately.

Debt to totol ossets voriotion. (Also known es the debt ratio and tha debt to asset ratio.) This ratio is often used as e substituta for the debt to worth retio. Remember thet totel assats equels totel liabilities plus totel owner equity. The debt to totel essats retio tells you directly how much of your essat base is finenced with dabt. In our exemple, the dabt to totel assets ratio is 43 percent. In other words, 43 percent of our assets ere financed by all forms of debt or liabilities. The other 57 parcent is funded by equity.

It is easy to convert the debt to worth ratio to the debt to totel essets ratio by applying the following formula:

$$\text{Debt to total assets} = \frac{\text{Debt to worth}}{1 + \text{Debt to worth}}$$

For example: $\frac{.77}{1 + .77} = .43$, or 43%

Current liobilities to total ossets voriotion. This refinement of tha debt to total asset ratio shows how much of your total assets are funded by short-term or current liabilities. The ratio in our example is 26 percent.

Long-term liobilities to totol ossets voriotion. (Also known as long-term debt to totel cepitelization.) This ratio shows how much of your total assats base is fundad by long-term debt. The ratio for our example is 17 percent.

The debt to total essats retio is tha sum of tha current liabilitias to total assats ratio and the long-term liabilities to totel assats ratio. Using the figures given under these last two variations, the debt to total assats ratio = 26% + 17% = 43%.

The last two variations ellows you to evaluete the relative portion of short- versus long-tarm liabilitias thet you are using to finence your businass. If you are borrowing a lot of money in the form of notes payable (under current liabilitias), and this mekes up e lerge portion of your total borrowing, you may be increasing the riskiness of your firm. Short-tarm borrowing (seasonel or damand loens) must be "rollad ovar," or renewed. If you have a bad year, the benk might not be willing to renew tha seasonal loan and may call the demand note. On the othar hand, if your borrowing is primarily long-term in netura, you must be prepered to repay the principal of the loan at maturity and must build up sufficient cash for this purposa. The elternativa of renewing or refinencing thet long-tarm debt does exist, but if the amount is large, your firm's performance and finenciel condition just prior to the loan's meturity will ba very important.

Since bank loans are frequently an important source of financing for a small firm, a few additionel comments are in order.

Sinca tha first objective of e bank is to avoid risk, the debt to worth ratio is often the first ratio bankers examine when avalueting a busiaess. Tbey use the ratio as one indax in making loan decisions. They use the ratio as one index in making loan decisions. But, the length or term of the loan requast is another important factor. Sbort-term loans, whether they are 90-day notes, seasonal loans, or demand notes, are designed to be self-liquidating. This means that they are granted by tha lender in advence of your peak selling seeson so that the profits and higher cash flow generated during this period can be used to pay off tha loans. Long-term loans are mede with the essumption that future profits will be usad to satisfy interest end principal payments. Often bankers want a lowar debt to worth ratio for e long-term loan than they do for a short-term ona.

Think of your business es e boat. The longer tha term of the loan you ask the bank for, the stronger the banker wants the boat (your business) to be, which means a lower debt to worth ratio. On a long voyege (during the period of a long-term

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loan), a lot of unforeseen problems can occur. Bankers want to know thet the boat—your business—can cope with such events and weather any storms that might arise. But on a short voyage (a short-term loen), the bank is more apt to take a chanca on a vessel that is not quite as sturdy.

A bank can live with excessive debt to worth in a company, if the company's ratio trend is in the right direction (getting iower) and it has sufficient coiiateral end profits (cash flow).

Other terms for a firm thet has a high debt to worth ratio include highly leveraged, undercapitelized, and overextended.

Times Interest Earned

While the debt to worth ratio and its variations are useful in determining the safety or leverage of your company, they do oot address the critical question, "How will the interest and principal on loans be repaid and when?" The times interest earned ratio does enswer part of thet question. It directly measures a compeny's ability to meet interest payments, and indirectly assesses whether or not the principal repaymeot is at risk. This ratio, theo, is of obvious interest to lenders and bankers.

Generally, e company with sufficient operating income can meet its interest obligations. Tberefore, operating income is the numerator in tbis ratio, with interest as the denominator.

Also known as: Interest coverege ratio

When to calculate: Monthly

Where to find data: Income statement

How to calculate: Operating income is divided by interest costs:

$$\text{Times interest earned} = \frac{\text{Operating income}}{\text{Interest expense}}$$

Operoting income is the result of subtractiog cost of goods sold and operating expenses from sales revenue. Note thet interest expense is not deducted.

Interest expense is the interest the firm pays on outstanding loans.

Form of answer: Times (thet interest expense can be covered)

Example:

$$\text{Times interest earned} = \frac{\$46{,}000}{\$5{,}000} =$$

9.2 times

Times interest earned means the number of times you can cover your interest payments with fuods from operetions, or opereting income. Here, operating iocome can cover the interest expenses 9.2 times.

How to analyze the result: From any viewpoint, the desirable direction for the times interest earned ratio is up. A high, stable ratio indicates there are sufficient profits and cash beiog geoerated by the operations of the firm to satisfy the interest expense requirements of existing debt. Low or fluctuating times interest earned ratios reflect instability and the potentiel inebility to meet interest expenses.

The greater the fluctuation in opereting income during e year, the more important the times interest earned ratio becomes. Seasonel businesses are characterized by these fluctuations, and they should aim for a ratio of 2 (times) during the slower periods of their operating cycles. These companies mey, however, sometimes miss the mark, and actually have a negative times interest earned ratio in months that show e loss. At these times, they need short-term or seasonel financing.

Notice that in our exemple the times interest earned ratio is calculated oo a historical basis. What heppened in the past is not as important as what is expected to happen in the future. While a historical ratio might be important if you have long-term debt, most lenders will be concerned with your projected ability to service their debt . . . and so should you.

A BANK CAN live with excessive debt to worth in a company, if the company's ratio trend is in the right direction.

When you ask for a loan, you will usually provide projected fioencial stetements. The lender will theo calculate ratios, such as times interest earned, based on your projections.

These projections and your historical statements will form a large part of the basis of a lender's decision to make or not

meke the loan.

Viewpoints:

Owner/stockholder. Owners are less concarned than bankars ebout a high times interest earned retio. An owner mey believe that a ratio of 5 times is perfectly adequate, while a bankar may prefer e ratio of 7.9, or 12 times. Owners, of course, went tha company to meet its interest obligations, but they don't require as great a degree of reassurance ebout that ebility as the banker does.

THE LONGER the term of the loan you ask the bank for, the stronger the banker wants your business to be.

Bonker. Bankers have an obvious vested interest in e feirly high times interest eerned ratio. They must be assured that interest payments will be met. Otherwise, the bank has e nonearning asset (tha loan made to the company), and it has put its depositors' money et risk.

Manager. The manager has to run the company so thet it can meet the times intarest earned requirements that e bank may impose on the compeny through the convents of a loan or the restrictions on it. If tbe company has a seasonel sales pettern, the times interest earned ratio can fluctuate from month to month. Tberefore, it is critical thet the manager be sure there is sufficient operating income to meet interest obligations during the weakest part of the sales year.

Adjustments and variations:

Depreciotion odjustments. One common edjustment to the times interest earned ratio is to subtract deprecietion from operating expensas, which will increase operating (casb) income. Or, putting it another wey, you add the amount of the period's depreciation to the operating income. Since deprecietion is a non-casb expense, it may causa operating (cash) income to be understated. If operating incomes reflects cash flow, and it does over the long haul, then edding depreciation to opereting lncome gives the amount of cash generated during e period. Since interest payments must come from cash, this depreciation adjustment more eccurately reflects e company's debt-servicing ebility. This can be particularly important for growing firms that are edding fixed assets and depreciating them under accelereted terms.

In our example, the depreciation adjustment causes the times interest earned ratio to increase from 9.2 times to 12.2 times. It tightens up, or strengthens, the times intarest earned retio.

Fixed chorge coverage ratios voriotion. Firms often beve mora fixed obligations than just interest payments. Additional obligations could include lease payments, principel repayments, and preferred stock dividends. The fixed charge coveraga ratios measure the ability of operating income to meet fixed expanses. A ratio can be calculated on the basis of one fixed cbarge, such as lease paymants, or on the basis of a number of fixed cbarges. We'll illustrate e fixed charge coverage ratio for two fixed chargas: laase payments and interest.

The ratio is calculeted tha same as times interest earned, except that laase payments are added to the numerator and denominator of the equation.

Fixed charge coverage =

$$\frac{\text{Opereting income + Lease peymants}}{\text{Interest + Lease payments}}$$

Leose payments are total peyments for the pariod.

Interest is total interest axpense, takan from the income statement.

For exemple, assume $10,000 of G & A expenses are for leese payments. Then:

Fixed charge coverage =

$$\frac{\$46{,}000 + \$10{,}000}{\$5{,}000 + \$10{,}000} = 3.73 \text{ times}$$

This means that oparating income can cover 3.73 times the fixed charge of leese

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end intarest paymants.

Creditors and lenders will use this fixad cbarge coveraga ratio (and othar variations) to assess the sefety of extandIng credit or making a loan.

Cash Flow to Current Portion of Long-Term Debt

The cash flow to current portion of long-term dabt (CF/CPLTD) ratio assesses whether the cash flow genereted from operetions is sufficient to make the long-term debt repaymants that are due within 12 months. These can include term money and all non-salf-liquidating debt; all repayments of principal on a loan. Like the times interest earned and debt to worth retios, cash flow to current portion of long-tarm dabt is most usaful and informetive when applied to financial projections (expected income end dabt) and not to historical statements, which show past incoma and debt. (Of course, projections are forecast about the future and no fectual information about the future; conditions can change and render the forecasts ineccurate.)

When to calculata: Monthly.

Where to find data: Net income and depreciation are found on tha income stetemant; current portion of long-term debt is found on the balance sheet.

How to calculata: Casb flow is divided by current long-term dabt:

$$\text{CF/CPLTD} = \frac{\text{Net income + Depreciation}}{\text{Current portion of long-term dabt}}$$

Net income plus depreciotion approximatas the after-tax cesh flow available to pey off debt. After-tax casb flow is used because principel repeyment is not e tax-deductible casb outflow or expanse.

Current portion (or current moturity) of long-term debt is thet amount of long-term debt which must ba paid within tha next year or eccounting period.

Form of answer: Times (that cash flow covers meturing dabt, or the number of dollars available to pay off eacb dollar of dabt to be repaid).

Exampla:

$$\text{CF/CPLTD} = \frac{\$24{,}000 + \$15{,}000}{\$10{,}000^*} =$$

3.9 times

(*Wa assume that $10,000 of other current liabilities is current maturity of long-tarm debt.) There ere 3.9 dollars eveileble to pay off aach dollar of maturing dabt.

How to analyze the result: Like the times interest earned ratio, cash flow to current portion of long-term debt assesses a firm's ability to service dabt, in particular, principal repayment, from eernings. Genarally you want a ratio of 2 to 3 times. While a ratio of 1 time is all that is necessary to pay off tha debt, the compeny must continua to oparate and spend cash elsewhere. A value above 2 times allows this. If the ratio is less than 1 time, it usually means that repeymant will come at the expansa of working capital unless additional term monay or capital is obteined. Most growing businasses find that they must replece their long-term debt to evoid cash (or working-capitel) crises. They renaw, or roll over, the dabt and oftan increase its emount to allow for continued growth.

BANKERS WANT assurance that a company can meet its interest obligations.

Viewpoints:

Owner. As tha stockholdar or ownar, you would usa this ratio to essess risk to casb flow and the firm's ebility to meet principal payments on debt. Tha lower the ratio, tha harder it is to meet tha dabt payments. If this difficulty is revealed by the finencial stetement through the CF/CPLTD, lenders will be reluctant to renew debt and advance additional loans to help support the necessary increese in assets required for growth, sales, and income. So a low CF/CPLTD ratio may indicate an inability to grow, and can place the firm at a compatitiva disadvantage.

Bonker. Benkers viaw this ratio as critical in monitoring a long-term loan and determining whether to extend e new loan. Tbay want assurance thet a company can meet its interast obligations (maasured by the times interest earned retio) and pay any principal due on a loan. The CP/CPLTD ratio givas bankers e fairly quick and fairly good indication of a compeny's ebility to meke those peyments.

Good lending officers know that debt

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. . .
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       ELSE
          B=A+C:
          D=3.14*C
760 IF S THEN
       PRINT #2,C
    ELSE 900
. . .
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900      760  ...
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service (including interest payments and principal repayment) can be such a high burden that it will place e firm on the brink of bankruptcy. They also recognize thet if the business is well run and growing, equity will be huilt up each yaar through edditional retained earnings. It is not unheard of for the lender to suggest a different loan structure from the one man-

THE MANAGER must ensure that there is sufficient cash flow.

egement proposes. For example, you mey have in mind e ten-yaar mortgaga loan for the purchase of equipment. Both interest and principai wouid be paid periodicaiiy, so that at the end of 10 yaars the loan balance would be zero. The lender might suggast e term loan (secured by the equipmantj under which interest paymants are made on a periodic basis but principel is not paid back until tha end of the tan years. The mejor edvantage of the term ioan is that totai debt service expenses include only the interest peyments. The equipment purchased is not going to produce immediate increases in salas and income. But it will generate additional salas and income over tha life of the equipmant and loan. in this wey the loen principal can be paid off et the end of the ten years.

Manoger. The maneger must ensure that there is sufficient cash flow to minimize tha risk of both interest and principal payment default and to support future firm growth. Otherwise, the company is in jeopardy. The manager must anticipate major outflows of cash and know where the money is going to come from. That means planning. For instance, some forms of long-term debt are not paid off on a regular basis. Suddenly (or it may seems so) the whole debt is due at once. The CF/CPLTD ratio may appaar acceptable until a year before a loan is due, and then it wiil take a jump. The managar must anticipate that situetion.

Adjustments and variations: Like most ratios, the CF/CPLTD has e number of possible adjustments and variations. The adjustments made depend upon who is using the ratio. Keep in mind that tha user of any ratio has e specific purpose. But all use ratios to assess the firm from their perspectives.

Expense odjustment. Adjustments are often made to the expense area of the incoma figure. The owner's personal expenses, which are usually discretionary, can be added to net income. Owners and lenders mey make this adjustment before calculeting the ratio. The formula would be:

$$\text{CF/CPLTD} = \frac{\text{Net income + Personal expenses + Depreciation}}{\text{Current portion of long-term debt}}$$

For example, assume you have $4,000 of personal owner expense. The adjusted ratio is calculated by:

$$\text{CF/CPLTD} = \frac{\$24{,}000 + \$4{,}000 + \$15{,}000}{\$10{,}000} = 4.3$$

That means you now have $4.30 avaiiahla to pay off each dollar of maturing debt. Remember thet the CF/CPLTD, without this adjustment, was 3.9.

The expanse adjustment almost always increases the ratio, so owners and lenders use it to get a more accurate gauge of how well cash flow covers debt that is due. But it is based on two assumptions. First, the personal expenses are not necessary to the efficient and profitable functioning of the husinass. And second, tha owner has the discipline to eliminate the expenses when cesh gats tight.

Debt odjustment. The CF/CPLTD ratio does heve its critics. One of the major criticisms of the ratio is that only a portion of debt is included in the ratio.

This criticism can be eliminated hy including *all* debt that is due within the next year. For example, if you have $10,000 due on long-term debt and $10,000 due on notes payahle, you could calculate the ratio as follows:

$$\text{CF/CPLTD} = \frac{\text{Net income + Depreciation}}{\text{CPLTD + Notes due + Damand loans}}$$

Example:

$$\frac{\$24{,}000 + \$15{,}000}{\$10{,}000 + \$10{,}000} = 1.95 \text{ times}$$

With the debt adjustment, the ratio in our example drops to 1.95 times from 3.9 times. This occurs because the denominator (dahts) increases 100 percent.

This debt adjustment always raducas tha ratio, so it is ona of the more stringant versions of CF/CPLTD. Lenders may use this edjustment. Owners usually don't, unless they think the firm is in troubla.

Profitability Ratios

This family of ratios is savad for last, not because it is the least important, but because it reflects the results of all areas of management. All the information convayad by liquidity, safaty/leveraga, and asset management ratios has an impact on profitability. Liquidity is necessary for profitability. If you can't pay your bills, you'll be out of business no matter how profitable you are. Leveraga, or the amount of debt you employ, affects the riskinass of your company from both e cash flow and profitability standpoint. And asset managemant has its impact on profitability through tha costs associeted with having assets, which are necessary to achieve and support your level of oparations or salas voluma. Profits are the bottom line. They are the net result of all policies you follow and all decisions you make.

IF YOU can't pay your bills, you'll be out of business no matter how profitable you are.

Profitability ratios relate profits or income to some other piece of financial information. Genarally this family of ratios is meda up of two subgroups: those daaling with profits relative to sales, and those that relate profits to invasted capital or assats. Both subgroups are covered here by the profit margin, return on assets, and return on equity ratios.

Profit Margin

The profit margin is a major performance measura that relates the level of profits to the lavel of sales. It compares tha money left over, after all expenses (except taxes), to net salas. Like all profitability ratios that relate profits to sales or oparations, the profit margin uses information from the income statamant. Here we'll describe this opening ratio in detail and discuss some common adjustments to it.

Also known as: Profit on nat sales; income on sales; profit margin on seles; aarnings to sales; before-tax profit margin

When to calculate: Monthly

Where to find data: Income statement

How to calculate: Tbe formula is

$$\text{Profit margin} = \frac{\text{Income before taxes}}{\text{Nat sales}}$$

Income before taxes should not includa extraordinary items. Extraordinary items are thosa revenuas or axpensas that do not usually occur in the normal coursa of busIness, such as revenues or expenses from salling land, settling major (and presumably nonrecurring) lawsuits, and so forth.

Form of answer: A parcantaga

Example:

$$\text{Profit margin} = \frac{40{,}000}{300{,}000} = 13\%$$

A profit margin of 13 percent means that after all expenses except taxes are paid, you have 13 cents left over out of aach sales dollar.

Annualizing a Ratio

Annualizing a Ratio

We suggest that you calculata most of tha financial ratios monthly, because that will give you a better feel for how well the firm is being managed. Not only will it help you track your company's performanca against ratio goals, but It will serve as an eerly warning system designed to help you avoid disastrous situations. But, before you can compara thase monthly ratios against annual ones (as reported in many industry average studies), you must adjust certain monthly ratios. Otherwise, your monthly ratios could look very out of line.

There are two ways to convart a monthly financial ratio to an annual ona. Tba first approach is to multiply the relevant incoma statemant data in a ratio by 12. A monthly income statamant shows incoma end expansas for just one month. Tbasa are much lower than tha annual Incoma statement data. When monthly incoma statement data are combinad with balanca sheet information to form ratios, the ratios will appaar too high or too low depending on the ratio. Multiplying tha income statement data in the ratio by 12 annuelizes the ratio end gives you a number that can be more easily interpreted and compared with industry everages.

The second method is to either multiply or divide the monthly ratio by 12. If tha income statemant data appears in the numerator of the ratio, tha monthly ratio sbould be multipliad by 12. If the income statamant data Is in the denominator, tha montbly ratio sbould be dividad by 12.

Lat's taka an exemple. Tha inventory turnover ratio combines information from tha income statement and balanca sheet. Here's what it would look like calculeted on a monthly basis:

Inventory turnover =

$$\frac{\text{Cost of goods sold}}{\text{Inventory}}$$

Inventory turnover =

$$\frac{\$15{,}000}{\$60{,}000} = .25 \text{ times}$$

Thls means that invantory turns over one quartar times each month. To annualize tha ratio and maka it compareble to Industry averages, aither multiply cost of goods sold by 12:

Invantory turnover =

$$\frac{\$15{,}000 \times 12}{\$60{,}000} =$$

$$\frac{\$180{,}000}{\$60{,}000} = 3 \text{ times}$$

or multiply the monthly turnover by 12:

Monthly invantory turnovar × 12 =

.25 × 12 = 3 times

In seasonal businesses the annualized ratios will fluctuata, reflecting the swings in business activity. For exampla, the inventory turnover may vary from 1 or 2 times during the slow period to 12 or 15 times during tha paak period. Knowing the seasonal pattern of the annualized ratios will halp you see whan things are getting out of line and allow you to take appropriate action before it is too lata.

How to analyze the result: The result of the calculation is e percentege, which is a relative number, not an absolute one. Some businesses depend on volume to make profits; others depend on margins. For example, two firms (in different industries) can have the same level of dollar profits but very different profit margins. A high profit margin on e iow ievel of dollar sales might produce the same level of dollar profits as a low profit margin on a high dollar sales volume. Thus, e posh jewelry store (with e high margin) and a supermarket (with a low margin) could end up with the same amount of dollar profits.

A BUSINESS can't usually survive poor and periodically negative cash flow, but it can survive short periods of negative profitability.

If the ratio is lower then expected, then one or more areas, most likely expenses, need ettention. Poor pricing and sales volume could also contribute to the lower ratio. To identify the problem area, it can be helpful to analyze the profit margin in conjunction with the gross margin (gross profit divided by seles). If the gross margin looks reasonable but the profit margin is low, the problem is operating expenses (selling, admlnistrative, or general) and interest expenses.

There is no general rule of thumb for evelueting this ratio. In actuelity, profit margin varies from industry to industry. To confuse things even more, it can vary greatly within one lndustry depending on the particular market a firm serves or the significant cost edventages one firm has over others.

The profit margin can also be used to measure subgroupings within a compeny, along division, product, or product group lines. The objective is to determine the most and the least profiteble products. Wlth this information you could decide to promote or drop products according to their profitability. But a word of cautlon is warranted here. Tracking sales by product is usually easy. But tracking the cost of each product can be time-consuming and expensive for many small firms.

Generally, a firm that shows reasonably good levels of before-tax margins that are consistent over time would be considered profitable and well-maneged. Erretic margins are often viewed with more distrust or fear then a consistently low margin. A business can't usually survive poor and periodicelly negative cash flow, but it can survive short periods of negative profitability.

Viewpoints: Everybody—owner, banker, and manager—likes high profit margins. Some stockholders, though, particularly if they are sole stockholders, would prefer to see profits and profit margins as close to zero as possible. They went to minimize taxes by deducting all possible legel expenses. These owner/stockholders might do well to remember the motto, "Room for bulls end bears but no room for pigs." Not only do many bankers take this attitude, but meny outside investors do es well. If these owners never anticipete borrowing or seeking outside equity, they can play the tax game. But, if they want the company to grow or expand, they need to look et the larger picture. Buiiding a strong foundation of equity is based on profits and will encourage others to join or support their compeny. In summary, most owners, bankers, and menagers prefer a higher profit margin to e lower one, and a consistent profit margin to an inconsistent one.

Adjustments and variations: Income figures (end retios based on those figures) below the gross profit line on the income statement cen often be adjusted to the advantage of small firms. Quite often some business expenses are not really necessary to the operation and profitability of the business. Rather, they benefit the owners directly and reduce taxable income and minimize taxes. Expenses such as personal cars or privete club memberships can be added to the earnings-before-taxes figure. When the profit margin is recalculeted, it increases. Overall, though, it is probebly best to use the lncome before taxes figure in the profit margin ratio when you want to assess the operational and financial manegement of your firm.

Net profit morgin voriotions. This is e common profitability ratio that measures profit per dollar of sales. It differs from the profit margin ratio described previously in that it uses income after taxes rather than income before taxes. It is calculated by dividing net income after taxes by net sales for a given period.

Taxes obviously affect the net profit margin and for this reason some people decide to use the net profit margin while others prefer the before taxes profit margin. Various fectors affect the tax line: investment tax credits (or tax credits of any type), state income taxes, tax loss carry forwards, end so forth. Anything that affects the tax line affects net income and the net profit margin. Therefore, the ratio is used by some to assess the overell profitebility of a firm including the tax management area. But others feel that the before tax profit margin better reflects the profitability of a firm and management performance because lt allows for fewer complicetlons that could affect the ratio, up or down. Because taxes are excluded from this retio, some manegers feel it is a more eccurate indicator of e firm's profitability.

The preference for one ratio over another extends to sources of industry avereges. For example, Dun & Bradstreet uses net profit margin while Robert Morris Associetes uses before tax profit margin. Whatever you prefer, double check that you are using the same ratio as the source when you make industry comparisons.

Return on Total Assets (ROA)

The return on assets ratio measures how productive your assets are. To put it another way, it measures how much profit you are generating with each dollar of your assets. The ratio is used for a variety of purposes, ranging from pricing to investment decisions. It is also one of the most commonly misunderstood and misinterpreted ratios.

Unlike profitability ratios drawn from income statement data, the return on assets ratio uses both income statement and balance sheet information. It relates profits to the level of investment in total assets. While profit margins relate profits to the level of sales activity, the return on assets reletes profits to the asset investment thet is necessary to support sales. ROA is e general indication of how profiteble and productive the firm's asset investment is.

The return on assets ratio, then, is e

bottom-line measure of both profitability and asset management, both of which are considered controllable by management. In fact, this ratio is frequently used as a performance yardstick in many large corporations.

Also known as: Return oo investment (ROI); Return on total assets; Rate of return oo investment; Rate of return on total assets

Wheo to calculate: Monthly

Where to find data: Income before taxes is found on the income statement, total assets on the balance sheet.

How to calculate: Use the formula

$$\text{ROA} = \frac{\text{Income before taxes}}{\text{Total assets}}$$

Income before toxes comes from the income statement and excludes any extraordinary revenues or expenses.

Totol ossets is found on the balance sheet.

Form of answer: A percentage

Example:

$$\text{ROA} = \frac{40{,}000}{230{,}000} = 17.39\%$$

This means that for every dollar of total assets, you're earning 17.39 cents of profit.

How to analyze the result: When ROA is too low, the problem area may be either a lack of profits or excess investment in assets. If ROA is too high, it can indicate that older assets (particularly fixed assets) may need to be replaced in the near future or that assets should be added to support growth and higher levels of sales activity. The determination of "too high" or "too low" is based upon comparison of the ratio with industry averages or with the firm's own ratio profile over time. Although some people apply a 20 percent rule of thumb (aim for a 20 percent before tax return on assets), that general rule may not be appropriate for your industry.

ROA is one of the first ratios used to evaluate a firm. If the ratio is too high or too low, you can further evaluate ROA by using profit margin or asset management ratios. Both profit margin and asset management influence the return on asset ratio. Specifically, ROA is equal to total asset turnover (net salas divided by total assets) multiplied by the before tax profit

Inventory Valuation Methods

The three generally accepted methods for calculating the inventory cost portion of cost of goods sold (for the iocome statement) and inventory value (for the balance sheet) are: FIFO, LIFO, and AVERAGE COST. Under FIFO (first-in-first-out), you assume first shipment (or purchase) items are sold first, and then subsequent shipment items. Therefore, the cost of the first items bought is used first, theo that of later shipments. Under LIFO (last-in-first-out), you make the opposite assumption—that the latest items purchased are sold before the earlier purchases of the same items. Therefore, the cost of the last items bought is used first, and then the cost of the older or previously purchased items. Average cost is a compromise between FIFO and LIFO. All purchase costs are averaged.

Let's see how each method of inventory valuation affects cost of goods sold. Assume that during the year, you made two purchases of 10 units each. The first time you bought the itams they cost $5 each. The secood time (later in the year), the price was $7 each. During the year, you bought 20 units of this item, but sold only 12. That leaves eight units in current inventory. You now want to determine the inventory cost of the 12 units sold and the ending inventory for the balance sheet.

(To calculate ending inventory, add ioventory purchases to your beginning invantory. Then subtract the cost of goods sold.)

Because you sold less than you purchased of this item, the different accounting methods produce different results. The inventory purchases portion of cost of goods sold is different under each method. Since LIFO yields the highest inventory cost in cost of goods, it will lower profits. So, if you opt for the inventory valuation method that produces the lowast profits and therefore the lowest taxes, LIFO is the method to use. It also yields the highest inventory turnover.

Notice that the price per unit of the second purchase was higher than the first. When prices are rising, LIFO is again an attractive valuation method because it lowers profits and minimizes tax liability. When prices are fairly stable, no method has a particular tax advantage.

For tax purposes, once you have selected an inventory valuation method, the Internal Revenue Service must approva any change to another method. You must also use the same method for tax purposes and financial reporting. You can't, for example, use LIFO for taxes and FIFO for financial reporting.

Inventory part of cost of goods duriog period

	FIFO	LIFO	Average cost
1st purchase	10×$5=$50	10×5=$50	10×$5=$50
2nd purchase	10×$7=$70	10×$7=$70	10×$7=$70
Total inventory purchase	$120	$120	$120
Units sold	12	12	12
Inventory	10×$5=$50	10×$7=$70	12×$6=$72
cost	2×$7=$14	2×$5=$10	
Cost of goods sold	$64	$80	$72

Inventory balance at end of period

	FIFO	LIFO	Average cost
Beginning ioventory	$20	$20	$20
Inventory purchases	$120	$120	$120
Cost of goods sold	$64	$80	$72
Ending inventory	$76	$60	$68

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margin (income before taxes divided by net sales). If ROA is too high or too low, you would evaluate both the total asset turnover and before tax profit margin to determine which is causing the greatest problem. Once this is determined, you can isolate the major problem areas and take corrective action.

THE profit margin is a major performance measure that relates the level of profits to the level of sales.

For example, assume that a low total asset turnover is causing ROA to be lower than expected. You can then evaluate the major asset turnover ratios to see where the problem lies. (These include the fixed asset turnover, inventory turnover, and receivables turnover ratios.) Assume the inventory turnover and receivables turnover ratios are in line with expectations but the fixed asset turnover ratio is too low. That means you have an adequate level of accounts receivable and inventory, but too high an investment in fixed assets for your level of sales. That's the cause of your low ROA.

In summary, a healthy ROA means that owners are getting more value on their investment and bankers are getting safety on their investment.

Viewpoints:

Owner/stockholder. To the owner/stockholder, a high and stable or growing return on assets ratio is important. It represents the efficiency with which both assets and capital are being employed. Stable or growing ROA ratios also tend to reduce the riskiness of both income flows and cash flows, thereby making a firm's profitability more attractive.

But a growing ROA is not always a positive sign. For example, assume that income before taxes has been the same for the last 5 years. But net fixed assets has declined over the same period. The result could be an increasing ROA. The explanation for this is quite straightforward. Net fixed assets is made up of fixed assets minus accumulated depreciation. If there are no new fixed asset investments over a period of time, net fixed assets will be reduced by the total amount of depreciation taken in those years (which is added to accumulated depreciation). Therefore, the declining net fixed assets causes the ROA to increase.

When ROA is used to evaluate management's performance, as it often is, caution must be taken to understand why the ratio is high or low. As indicated above, a high and growing ratio is not always in the best interests of the owner/stockholder. Minimizing additional fixed asset investment will cause ROA to improve. But if management does not keep up the facilities (building, plant, and equipment), in an attempt to look good in terms of ROA, owners' investment may be hurt in the long run. Maintenance and upkeep are necessary to keep most fixed assets productive and useful. If assets are not maintained they will not have as long a useful life as they should. If they must be replaced too soon, that replacement usually carries a higher price tag than the cost of properly and prudently maintaining them.

Banker. To the lender or creditor, a relatively high and stable or growing ROA indicates safety if it is accompanied by a good debt to worth ratio. Given the general correspondence and linkage between profits and cash flow, a high ROA means good management and safety.

Manager. In addition to keeping both owners and lenders happy, a relatively high ROA usually verifies that management is operating the firm effectively and efficiently. ROA is a key number used to assess both the firm and management's performance.

Managers can also use ROA to analyze product groups, management groups, or asset investments at different locations. For example, the manager of a retail business with several locations could use ROA to analyze the performance of each store. Or, a manager could analyze the performance of individual products.

Adjustments and variations:

Total assets adjustments. Adjustments to ROA depend upon the user, and most are made by people outside the firm. Many of the common adjustments to the assets part of ROA are the same as those for the debt to worth ratio. They include

the hidden assets and the intangible assats adjustments. The difference between making thase adjustments to ROA and to tha debt to worth ratio is that for ROA intangible assets would be subtracted from total assets and hidden assets would be added to total essets. The effect of the intangibla assat adjustment is to increase the ROA ratio. The hidden asset adjustmant decreesas the ROA.

Tha third adjustment commonly made is to subtract the value of any asset not directly related to the business from tha total assets figure. These assets could include assets used by the owner, such as e parsonal car.

fncome before toxes odjustments. These adjustments are tha same as those discussad under profit margin. Certain business expanses incurred in asset management, described under the last adjustment, can be added to the income-beforataxas figure. Sinca this increases income, ROA also increases.

After-tax ROA voriotions. Nat income can be used instead of income before taxes. That givas you an after-tax ROA, which is usually lowar than bafore-tax ROA. This means that for every dollar of owner investment, 30.77 cents was earned during this accounting period.

How to analyze the result: The return on equity (ROE) ratio answers the question, "How profitable is the owner's invastment?" It represents the and result of all management's afforts. These include pricing decisions, cost control, asset managament, financial management, and financing policies. For the owner/manager, return on equity represents the results of ell his or her efforts.

Viewpoints:

Owner/stockholder. This ratio represents the bottom line for an owner or stockholder of a firm. If the return on equity is not as high as other evaileble investmants, tha stockholder will ba dissatisfiad. For tha closely held or small firm, which is not wholly owned by management, a lower than desired return on aquity can pose serious problems. If the management's ownership position is not sufficient to control tha overall destiny of the organization, other stockholders who are dissatisfied may impose policies that are not consistent with the management's desiras and judgaments. The nonmanagement stockholders want to improve the valua of their investmant.

Stockholders expact their investment to earn a rate of return at laast equal to othar investments of comparabla risk that are available to them. Ideally, ROE should be stable and at a high enough leval to ensure continuad stockholder support and ownership of the firm.

Banker. Lendars and creditors generally view return on equity as less important then the ability of tha firm to meet its obligations, such as interest payments. But they do look at ROE as an indication of how well all aspects of the business are being managed.

Manoger. Since most small businasses are managed by their owners or principal stockholders, these managers also have the goal of a good return on investment. They often put in long hours and the company becomes a very large part of their lives and of their family's. To many, the emotional investment or commitment to the business is an intangible addition to ROE. They value other rewards, such as autonomy, in addition to profit.

Therafore, managers of small firms may not always seek a high return on equity. The tax disadvantages of profitability are one reason. Once a satisfactory level of return is achieved, the owner/managers may have other goals and motivations beyond profits, or increasing the ROE.

Adjustments and variations: Variations usually deal with the way income or total equity is calculated. Thesa were discussed under the debt to worth ratio. The first two we will discuss involve income variation. The second adjusts the equity figure for intangible assets.

After-tox return on equity variation. The variations of return on equity are made to serve both owners and lenders. The most common is to use net income instead of income befora taxes. In our example this would produce

$$\text{ROE} = \frac{\text{Net incoma}}{\text{Equity}} = \frac{\$24{,}000}{\$130{,}000} = 18.46\%$$

This adjustment causes ROE in our example to drop from 30.77 to 18.46 percent. It shows what effect taxas have on the ROE.

After tax return to common stockholders voriotion. In firms where part of equity is in the form of preferred stock, common stockholders will be concerned with the income that is available to them, not with

Types of Debt

Types of Debt

Thara are basically four types of debt a firm can hava: self-liquidating debt; demand loans; term loans; and long-term debt.

- Self-liquidating debt is made up of those obligations that arise during tha normel course of business, such as accounts payable, wages dua, and taxes dua. Thay usually vary with tha laval of sales activity. As a result, self-liquidating debts are somatimes thought of as spontaneously ganeratad forms of dabt and financing for a firm, and they are usually paid off during the normal coursa of businass.
- Demand loans may not have a specific due data, but thay do have a number of conditions. If thosa conditions are not mat, tha loan will be called in, or damended. Common conditions (often called restrictiva covenants) can include a minimum leval of working capital, a minimum current ratio (as an index of liquidity), or a maximum leval of debt.
- Term loans have a specifiad dua data, and are often seasonal loans. For axampla, you might gat a term loan to stock up on inventory for tha coming sales season.
- Long-term debt is normally carried by a compeny for a year or more, and includes financing for real estate or equipmant. Usually, long-term debt tarms also contain certain restrictions to halp protect tha lander's investment.

Companies often have a mix of debts, and lenders may inquire about the makeup of that mix. More specifically, they may want to know if their loan is subordinated to another loan. A subordinated loan means that if a company fails, tha subordineted debt holder receives nothing until all senior, or unsubordinated, debt holders are paid back. Baing a subordinatad debt holdar is lika baing in second, third, or fourth place in the debt-payback lina. To avoid that situation, a lander may ask that a loan be secured (mada safa or backed) by a company's accounts receivabla or invantory. Or lendars of demand loans (a type of loan that is unsacured) may build in a loan cleusa that gives them second claim on certain company assets. In avaluating tha safety of their individual loans, landers look at tha general debt and loan mix of a company.

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the net income which does not include dividend payments to preferred stockholders. This variation requires two adjustments: subtracting the preferred stock dividends from net income to show which income is available to common stockholders, and subtracting the preferred stock

BOTH PROFIT margin and asset management influence the return on asset ratio.

from equity. The after-tax return on common equity is calculated by

$$\frac{\text{Net income} - \text{Preferred dividends}}{\text{Total equity} - \text{Preferred stock}}$$

If in our example there was $20,000 in preferred stock that pays a 5 percent dividend ($1,000) each year, the ratio would be

$$\frac{\$24{,}000 - \$1{,}000}{\$130{,}000 - \$20{,}000} = 20.91\%$$

Depending on the size of the preferred stock investment and dividends, the after-tax return on common equity may be higher or lower than ROE.

Return on tongible net worth voriotion. The return on tangible net worth adjusts equity for intangible assets such as goodwill or patents. Intangible assets are subtracted from owner equity. For instance, if your assets include $8,000 of intangibles, you would compute the return on tangible net worth as:

$$\frac{\text{Income before taxes}}{\text{Equity} - \text{Intangibles}} =$$

$$\frac{\$40{,}000}{130{,}000 - \$8{,}000} =$$

$$\frac{\$40{,}000}{\$122{,}000} = 32.79\%$$

This adjustment, in our example, increases ROE from 30.77 to 32.79 percent. Since intangibles may have little real or lasting value, this variation presents a more realistic picture of the profitability of assets investment. (Note: Robert Morris Associates reports industry averages for this ratio.) */PC*

LANGUAGES/DOUGLAS CLAPP

The long-awaited Microsoft C Compiler System has arrived, exceeding all expectations and destined to become the MS-DOS/Xenix language of choice.

Microsoft C Unveiled

Microsoft C Compiler System
Microsoft Corporation
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Microsoft C has arrived. This news may thrill you, befuddle you, or leave you yewning, but its significance could be immense.

Microsoft C was long awaited. The anticipation began when Microsoft revealed that PC-DOS (MS-DOS) was only the first level of an opereting system titled Xenix. Microsoft Xenix is e commerciel version of Bell Lab's UNIX, an operating system that programmers like to compare with e fine sports car: fest, responsive, and precisely engineered. Xenix maintains the high performence of UNIX, but couches it in e friendlier interface for nonprogrammers.

PASCAL IS prim and proper and a trifle conservative.

Some of Xenix's power is seen in DOS 2.0's pipes and filters, two concepts taken directly from Xenix/UNIX. Future versions of DOS may contein some, if not all, of the Xenix features. In many weys, C is inseparable from UNIX/Xenix. The Language C was created by Dennis Ritchie, a scientist from Bell Labs. UNIX was written in C; almost all UNIX programs are written in C; the C compiler itself was written in C. In Ritchie and Kernighan's classic text, *The C Programming Languoge*, the text-handling software was written in, yes, you guessed it, C.

Defining C is tricky. Often called e systems programming language, C is now becoming a serious rivel to that other complex and powerful language, Pascal.

Pascal is a high-level, modern, block-oriented, structured lenguage. It's prim

and proper and e trifle conservative, understandable traits considering its upbringing as a languega designed to teech proper programming methods.

C, however, grew up on tha othar sida of the tracks—the real world whare spaad, efficiency, and most of all, results matter. C can be structured if you lika, but structuring is not required. If you prefer programming for speed rathar than alagance, C will accommodate you. It doesn't require BEGINs and ENDs, or NEXTs after FORs. Unlike Pascal, C is not rigidly defined. Its attitude seems to be, "If you want to do it, then you must know what you're doing. Go ahead."

But because C refuses to hold your hand, careful programming is a must. Remember that with the increase in speed comes a potential decrease in safety.

Is C, then, e high-lavel languaga? Ritchie calls it a "low-level" language; Microsoft's C manual calls it a high-leval language. And, in e sense, it is both. Like assembly language, C allows you to program the computar at a low level, using simpla objects and oparetors such as numbers, addresses, matb, bit manipuletion, and logic. Like high-lavel languages, it employs functions, but not the procedures and functions of Pascal. In C, the concept is simpler, but powar is not secrificad. In typicel UNIX style, the functions are terse and potent, and mucb can be dona with only e few lines of program coda. C also provides e variety of program control structures, tests, end aesy accass to pointers for direct access to eddresses and data objects. Although the language itself is small, an extensive library of prewritten functions puts a wealth of tools et the programmer's disposal. If the tools you need aren't in tha library, it's simple enough to creete your own. So maybe C is a high-laval languaga after all. Or meybe it's the best of both.

C Data Types

Type	Length in bits	Range
char	8	0 to 255 (ASCII charactar sat)
int	16	−32768 to 32767
short	16	−32768 to 32767
unsigned	16	0 to 65535
long	32	−2 × 10^9 to 2 × 10^9
float	32	+/− 10^−37 to +/− 10^38
doubla	64	+/− 10^307 to +/− 10^307

Figure 1: C doto types offer on impressive range of size ond precision. Float represents floating point ond is precise to 6 or 7 decimol digits. Double is o flooting-poInt type with 15 or 16 decimal digits of precision. (Figure courtesy Microsoft Corporation.)

WITH THE increase in speed comes a potential decrease in safety.

Microsoft's Standard

Becausa C is a relatively naw lenguage, a standard version of C exists, at least in theory. In typical fashion, Microsoft chose to market a version of C that includes tha full C lenguega (not merely e subset), and implements almost all the standard functions described in *The C Programming Languoge*.

The functions, macros, and data types included are impressive. The numerical date typas includa sbort, with a limited range but quick execution; and, double, which allows 15 or 16 digits of precision. Date types are shown in Figure 1.

Microsoft's C was originally daveloped by Lattice, Inc. and Lifeboat Associatas. Markatad under the nama Lattice C Compiler, it quickly earned e reputation as one of the finest and most complate C languegas availabla. According to the C manual, Microsoft chose Lattice C both because of the quality of code generated and because Lattice C was designed to work with Microsoft's LINK program.

A further indication of Microsoft's commitment to standard C is tha inclusion of *The C Programming Lanuoge* in evary C compiler package. The book is e welcome bonus, especially for beginning C programmars.

BY CHOOSING Lattice, Microsoft resisted the temptation to fiddle with C.

Who Needs C?

Initially, C buyers will probably fall into two categories: experienced programmers and hobbyists. Experienced programmers wiii demand C for its power, speed, and ability to genarate large applications quickly. Hobbyists, ready for e naw language (maybe a bettar Pascal) or intrigued by the claims made for C, sbould also contribute significantly to sales. Both groups will be further tempted by Microsoft's unofficial blessing of C as tha standard MS-DOS/Xenix ianguage of choice. After all, you don't think that Microsoft programmers write in BASIC, do you?

Portability is also e consideration. Developing software is expensive; up to 90 percent of industrial microprocessor project costs are spant in software development. Exparts estimata that aech line of debugged code costs between $10 and $20 to produce.

```
argv[argc++] = lina;
```

Thet'll be $20, please.

As you can see, the ebility to run one program on many different computers is important.

Because C is new and still rather standard, industry watchers hoped that, unlike Pascal, C would remein C—that the Microsofts and Digital Researches of the world wouldn't try to "improva" C and end up writing variations that would splinter the language.

By choosing Lattice, Microsoft resistad the temptation to fiddle with C. That decision kaeps transportable standard C not only alive, but alive and kicking.

Don't forget speed. Like all compiled languages, C is fast. How fast? It depends. It's not as fast as assembly language. All things being equal (which they never are), assembly language is perhaps two or three times faster then C. Compared to interpreted IBM BASIC, C is probably more than 100 times faster; what takes 1½ minutes in BASIC may take less than 1 second in C. The C compiler produces true machine language object programs, rather than an intermediate code, such as USCD Pascal's P code, which can't match native code in speed.

Program development speed also counts. A well-constructed native code Pascal compiler may produce programs that match C for speed. It's doubtful, however, that the Pascal programmer can produce his program as quickly as the C programmer can produce his. (All things being equal, which, of course . . .)

Speed is not the only seduction of C. As with all languages, C provides a unique way to approach and solve problems. Its tarseness, which at first looks like an impediment to learning, eventually becomes one of its strong points. Because the language is compact, expression is clear, and the code cleanly expresses the programmer's most subtle thinking.

In many respects, C, like LISP, is a world unto itself. You may find that it is not only an interesting place to visit, but a nice place to live your programming life.

The C Package

The Microsoft C package consists of *The C Programming Language*, three manuals encased in one large-ring binder, and two single-sided disks. The compiler requires a minimum of 128K and one disk drive. (But don't count on getting much done without two drives.)

The compiler manual doesn't presume to teach C or offer programming tips; it leaves that to Ritchie's text. Instead, the manual covers the MS-DOS implementation of C, Microsoft's language definition, and library functions. The manual is extremely thorough, and as they say in

Microsoft C Library Functions

malloc	UNIX-compatible memory allocation
calloc	allocate memory and clear
free	UNIX-compatible memory release
getmem	get a memory block
rlsmem	release a memory block
allmem	allocate all available memory
sizmem	get memory pool size
rstmem	reset memory pool
sbrk	set memory break point
rbrk	reset memory break point
fopen	open a buffered file
freopen	reopen a buffered file
fread/fwrite	r/w blocks of data from/to file
fclose	close a buffered file
getc/getchar	get a character from file
putc/putchar	put character to file
fgetc/fputc	get/put a character
ungetc	push character back on input file
gets/fgets	get a string
puts/fputs	puts a string
scanf/fscanf/sscanf	formatted input conversions
printf/fprintf/sprintf	generate formatted output
fseek	seek to a new file position
ftell	return current file position
ferror/feof	check if error/end-of-file
clrerr	clear error flag for file
fileno	return file number for file pointer
rewind	rewind a file
fflush	flush output buffer for file
setnbf	force line buffering for file
open	open a file
creat	create a new file
unlink	remove file name from file system
read	read data from file
write	write data to file
lseek	seek to specified file position
close	close a file
getch/putch	get/put character from/to console
ungetch	push character back to console
cgets	get string directly from console
cputs	put string directly to console
cscanf/cprintf	formatted I/O directly to console
exit	terminate program execution; close files
_exit	terminate execution immediately
setmem	initialize memory to char value
movmem	move a block of memory
repmem	replicate values through memory
strlen/stclen	measure length of string
strcpy/stccpy	copy one string to another
strcat	concatenate strings
strcmp/stscmp	compare two strings
stcu_d	convert unsigned integer to decimal
stci_d	convert signed integer to decimal string
stch_i	convert hexadecimal string to integer
stcd_i	convert decimal string to integer
stpblk	skip blanks (white space)
stpsym	get a symbol from a string
stptok	get a token from a string
stpchr	find specific character in string
stpbrk	find break character in string
stcis/stcisn	measure span of a character set
stcarg	get an argument
stcpm	pattern match (unanchored)
stcpma	pattern match (anchored)
stspfp	parse file pattern

Figure 2: The extensive library of functions included with Microsoft's C handle memory allocation, file-handling, system I/O, and character string manipulation.

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graduate school, rigorous. If you're new to computers, C is probably not a good first languaga to learn.

The remaining manuals covar the Microsoft LINK linker utility and Microsoft LIB, a library manager. Both LINK and LIB are used in conjunction with the C compiler; LINK links together compilad C modules and LIB managas a library of modules that can be used with LINK. Figure 2 lists the library functions, which ara, in effect, prewritten program portions. Figure 3 details various character and arithmetic macros.

YOU MAY find that C is not only an interesting place to visit, but a nice place to live your programming life.

The manuals include tables of contants, illustrations where necessary, datailed explanations of functions, good indexas, and error massages with langthy comments.

Inside C

The two disks that comprise C include tha compilar proper, the LINK and LiBrary programs, various utllities, assembly language routines, and sample programs (see Figure 4). The actual C compilar is divided into two portions: MC1 and MC2. A program to be compiled needs to pass through both stages. A batch fiie, MC.BAT, will handle thosa datails, if you wish.

Takan togather, MC1 and MC2 taka up about 117K on disk; so it's obvious that a 128K systam is the minimum for compiling programs.

Compiling a C program involves procassing the program through MC1, then MC2, and finally through tha linker to produca an object program, ready to be run. C.OBJ and MC.LiB are also to be includad in the procass; C.OBJ defines

Character Type and Arithmetic Macros

MACRO	Yialds 0 or nonzero; nonzero if (c) is:
isalpha(c)	alphabetic
isupper(c)	uppercase
islowar(c)	lowarcasa
lsdigit(c)	digit
lsxdigit(c)	hex digit
isspace(c)	whita space
ispunct(c)	punctuation
isalnum(c)	alphabetic or digit
isprint(c)	printabla (lncluding blank)
isgraph(c)	graphic (axcluding blank)
iscntrl(c)	control character
isascii(c)	ASCII (0-127)
iscsym(c)	valid characlar for C identifier
iscsymf(c)	valld first characlar for C ldantifiar

Tha naxt two macros convart, rather than test:

touppar(c)	Converts (c) to uppercasa if lowercasa
tolower(c)	Converts (c) to lowercase if uppercase

Three genaral arithmetic macros are provided:

max (a,b]	Returns tha maximum of a and b
min (a,b)	Returns tha minimum of a and b
abs (a)	Returns to absolute valua of a

Figure 3: The character macros pravided affer pawerful tools far efficient text analysis and manipulatian. They are also extremely fast.

entry and exit points for the program, and MC.LIB contains the run-time and library functions.

Seven options for compile time allow for everything from unnested comments, including debugging information in the file, to such esoterica as "worst-case aliasing, which abandons any optimizations based on favorable pointer assumptions." Favorable pointer assumptions? Well, let's just say that if you're into tricky C programming, the compiler will not desert you.

SAMPLE C programs are excellent confidence builders for those new to the world of compiled programs.

No Weak LINK

LINK is a powerful utility. It strings together a number of separately written C programs into one larger program. LINK also searches library function files for unresolved external references and resolves external cross-references. A listing of error messages (if produced) and resolutioo of external references is produced during the linking session.

LINK can handle programs up to 385K, using up to 255 segments. Each module may reference a maximum of 256 external modules; up to 8 libraries can be searched during linkage, and up to 1024 public symbols may be defined. C, however, limits its programs to 64K of code and 64K of data, still enough for massive programming efforts.

Like the compiler, LINK offers a number of options, here called "switches," that determine where and how the program is loaded, and make available line numbers and addresses of source statements, and maps of all global symbols used in the program.

Compiler operation is swift. Both compiling and linking sessions are easily accomplished and offer great flexibility in program origination.

One significant feature is the Object

Files Included with Microsoft's C Compiler

MC1.EXE	C compilar (Phase 1)
MC2.EXE	C compiler (Phase 2)
FXE.EXE	Function extraction utility
OMD.EXE	Object module disassambler
LINK.EXE	Linker program
LIB.EXE	Library program
C.OBJ	C program entry/exit module
CC.OBJ	Version of C.OBJ to produca .COM filas
MC.LIB	Runtime and I/O library
MC.BAT	Batch program to run MC1 and MC2
STDIO	Standard I/O header file
CONIO.H	Console I/O header file
CTYPE.H	Character typa haader file
MAIN.C	Standard library version of_main
TINYMAIN.C	Abbreviated_main version
FTOC.C	Fahrenheit to Celsius sample program
CAT.C	Fila concatenate sample program
SIEVE.C	Eratosthenes sieve sample program
FXU.C	Source for function extract utility
CONIO.C	Basic consola I/O functions
C.ASM	Assembler source for C.OBJ
CC.ASM	Assembler source for CC.OBJ
IO.ASM	Sampla Assemblar program

Figure 4: These files fill two single-sided disks and include the compiler, linker, Library Manager, and o wealth of functions, utilities, and samples. (Figure courtesy Microsaft Corparation.)

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Module Disassembler. The disassembler provides an assembly language listing of the machine code instructions generated by the compiler. If the -d option is chosen prior to compiling, the disassembler can produce an assembly language listing interspersed with the actual C source code lines. When used with the link mep end MS-DOS's Debug utility, the listing is e powerful tool for debugging or low-level optimization.

However, a knowledge of 8086/88 assembly language isn't required to use the C compiler. Compiling programs is e reletively painless affair, and the sample C programs are excellent confidence builders for those new to the world of compiled programs.

As you can see, Microsoft C is not the ideal tool to whip up a five-line program. But nobody said it was; there's alweys BASIC for lightweight programming efforts.

No Surprises

As expected, the Microsoft C Compiler is e sophisticated, high-quality product. There are no rough edges, no omissions, no questioneble design or implementation choices. Everything works cleanly, fast, and well. Documentation is thorough and excellent.

For many companies, hitting all the ebove in one peckage would be e miracle. For Microsoft, anything less would be surprising.

Microsoft C is sure to become the de *facto* standard for C compilers, and there is no reason it shouldn't. Microsoft officiels have hailed the edvent of 16-bit micros as a necessary foundation for more powerful software tools.

MICROSOFT C brings enormous programming capabilities to desktop computers.

These tools are beginning to arrive. Microsoft C brings enormous programming capabilities to desktop computers. The result may be en increase in the number of complex programs available for the IBM Personal Computer and other computers running MS-DOS.

After all, it's possible to do almost anything in C thet can be done in assembly language, and with great savings in programming time, and elimination of time spent on rewriting for different machines.

Regardless of whether it attains long-range significance, Microsoft C is destined to become an instant success. */PC*

Douglas Clapp is a free-lance writer and contributing editor for InfoWorld mogozine.

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APPLICATIONS/FRANK J. DERFLER, JR.

The National Park Service uses an IBM PC to gather on-location information needed to service facilities ranging from roadside comfort stations to the Statue of Liberty.

Servicing The Park Service With A PC

The National Park Service needs help. Managing property in every state and U.S. territory, it also oversees maintenance on buildings and structures that may range from e simple comfort station in an Alaskan roadside park to the Statue of Liberty on Liberty Island. Many of the structures the Park Service is responsible for are in need of repair end renovation, but before any work can be carried out, accurate information ebout eech of these facilities must be obtained and evaluated. Gathering auch information is an awesome task due to the number of structures, the diversity of their needa, and the geographic distances between them. The National Park Service needs en efficient way to carry out its task.

This need becomes more evident when you consider that the Park Service has to compete with other highly automated and aggressive agencies for a share of the federal budget. In competition of this kind, the amount of money allocated often la determined by the volume and precision of the data supporting the request. Recent legislation has turned proceeds from the operation of concessions on Park Service property back to the service for use in park fecility meintenance. The Park Service needs an accurate picture of the condition of its facilities, so meintenence priorities can be established. A computer can provide that picture by collecting deta, arranging it into different categories, end presenting It In readable and accurate form. So, the National Park Service hes turned to the IBM PC for help in its widespread information gathering effort.

Research into the best ways to collect architectural and engineering dete et geographically distent locations is being conducted at Georgie Tech University under the leadership of John Myers. Myers is working under a National Park Service research and development contract called the "Building Inventory and Analysis Program." The study team started work early this year and has come up with a well-developed data-collection and engineering-assistance system, which la being tested end proven in the field.

The word system, in this case, means more than just computer hardware and software. It includes a fully equipped and dedicated mobile van, sophisticated communications links, reference materials, photographic services, a data input team, and grephic generation capabilities. Myers and his staff have developed a total, well-integrated system designed to provide information and assistance to the Park Service employees in the field, and to help fight the Washington budget battles.

The locations to be surveyed are often separated by considerable geographic distances, and are sometimes in remote locations, so the survey team needs a fully mobile, self-contained fecility. When the survey and assistance team arrives et e location, it must be put to work as quickly as possible; they can't waste time trying to find working space and support. The Georgia Tech research group developed a

***COROLLARY** programs, such as fire safety, park access for the handicapped, and health services, could also benefit from the survey.*

The IBM PC haused inside the Mabile Reseorch Laboratory uses both dotobose management and cammunications software to serve the survey team.

When the teom storts work, the surveyors set up radio systems to link the laboratory into the public ond federal telephane networks.

concept called the "Mobile Resource Laboratory" to put the team on the job and to keep them there. The leboratory is housed in a reclaimed 1973 GM Motorhome. The center of ectivity in this laboratory is an IBM PC, with data collection and communications cepabilities. The job of the PC is to receive and categorize information, and to transmit it to several central locations. The system can also retrieve information that aids local maintenance crews.

According to Myers, the Netional Park Service believes it hes about 16,000 buildings on its properties. Survey teams could have used clipboards and 3-by-5 cards to record ell of the building survey deta, but if that were the case, even a simple fector, such as a property with more than a few buildings would have created a cross-indexing end referencing nightmare. The paperwork alone would have amounted to another national monument. Developing a computerized solution takes more time and money, but the dividends are high.

The activities of the three-man team—which includes a civil engineer, an architect, and a support person who serves es the driver, communicator, and computer operetor—are centralized in the Mobile Resource Laboratory. The computer helps the team take inventory of 153 major survey elements. Each survey element becomes e record in the database. The resulting database must be flexible, since it both identifies work to be done end records the changes in maintenance ections on e regular basis.

Hardware and Software

The Georgie Tech development program has about 12 IBM PCs in use. One is in the mobile leboratory and the rest are used in a dete center on the Atlante campus, where entries and updates are mede, programs are developed, and reports are produced. These PCs use e multifunction board to provide 512K RAM and the needed communications ports. The large amount of RAM comes in the form of a solid-state disk end greatly speeds up operetion of the detabese program. Because the end product is often a lengthy paper report, Quedram's Microfazer print buffer is used to free the computer for other work while the printer cetches up.

Two software peckages form the basis of the Mobile Resource Lab's computer operations. The ectuel database entry end report generation work is done with Ashton-Tate's *dBose II*. The important communications links are operated using Crosstolk from Microstuf.

The *dBose II* data entry and report generation modules were not written by computer programmers, but by the engineers and architects who will actually collect and use the information. The reports can provide various levels of detail depending on the level of technical interest of the user. Plotters and color graphic displays add visual impect to the reports.

Importance of Communications

Because the Mobile van may be used in remote areas, It is equipped with special

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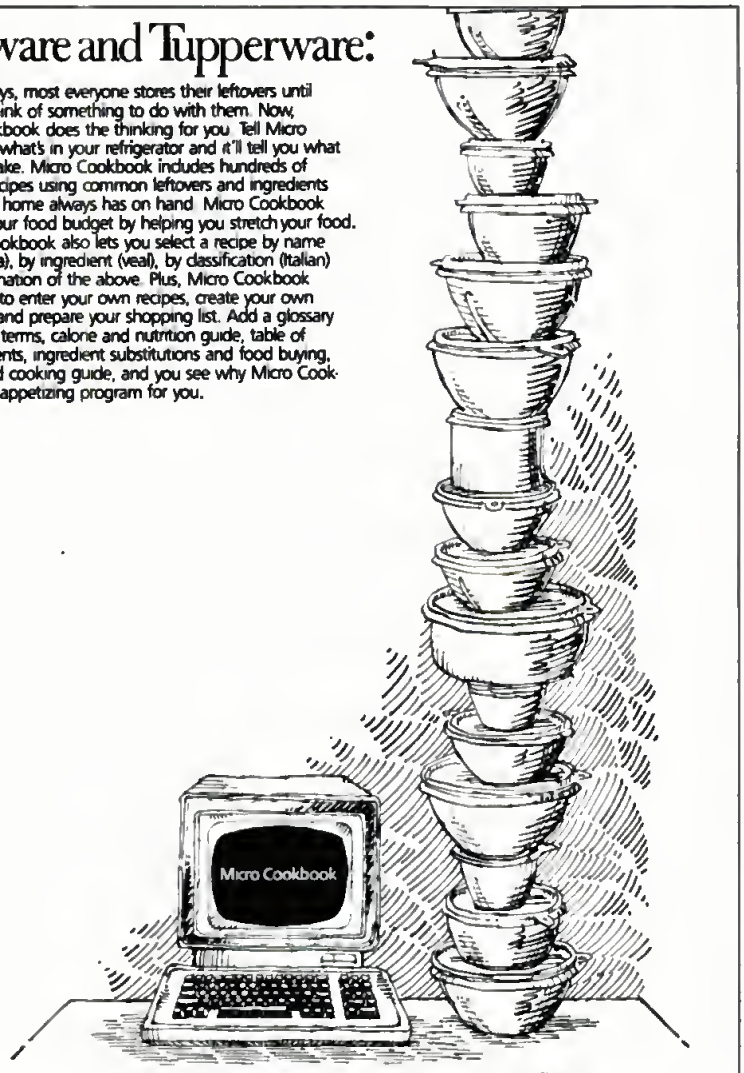

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Motorola radios that can be used to extend communcations out to the nearest phone line. The data-checking capabilities of Crosstalk are particularly useful when information has been transmitted over weak communications links, such as rural telephone lines patched over remote radio circuits. Crosstalk can detect garbled data as soon as it is received, and will automatically request that the host retransmit the small block containing the bad data. The Crosstolk-equipped PC handles files of

THE survey team needs a fully mobile, self-contained facility.

information on such subjects as special paints, protective techniques, and construction practices, for use by the maintenance crews. Myers stated that, "This communicationa capability is the single most critical factor in translating the otherwise dry survey data lnto results."

Accuracy and Economy

The data collection process pioneered by the Georgia Teach team has proven to be an economical way to get the job done. A survey of this kind done under contract by a typical architectural and engineering firm would probably cost about 20 cents per square foot of facility. The prototype system, even with its study and start-up costs can do the job for about 18 cents per square foot; with a full-scale project, that price could drop to 6 cents. Such a project would enable reports to be transmitted automatically to regional and national headquarters of the Park Service. Corollary programs, such as fire safety, park access for the handicapped, and health services, could also benefit from the survey. But for now, such programs are a long way down the road.

At present, the Mobile Research Laboratory is in the midst of surveying about 1,000 locations, though actual repair and renovation haven't yet begun. But with an IBM PC at the heart of its operation, perhaps the needed funds will be allocated soon, and then the National Parks will better serve their visitors. /PC

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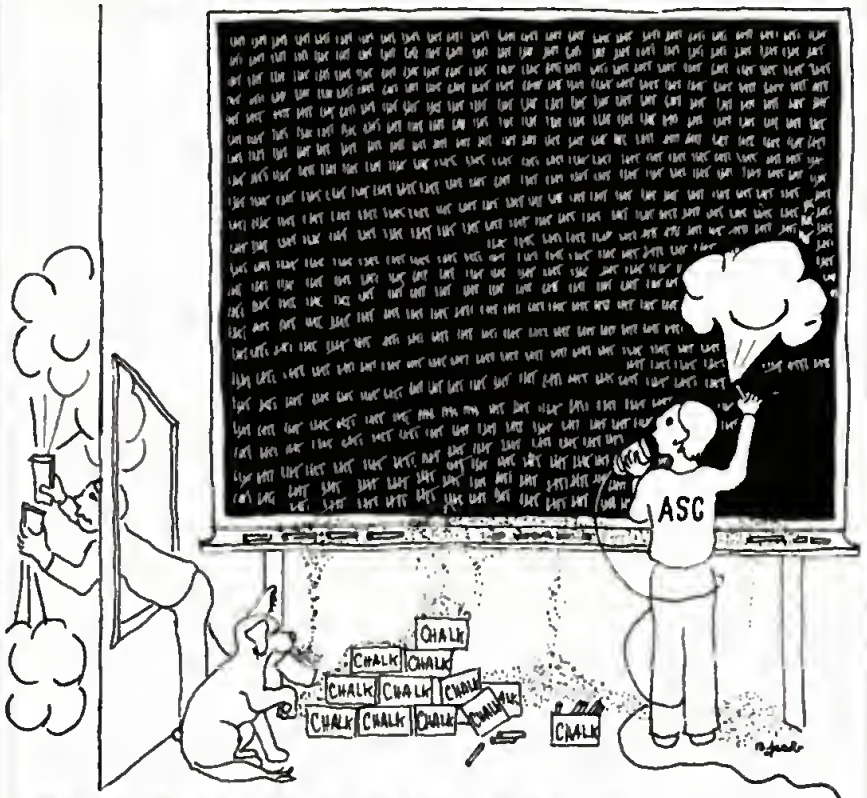

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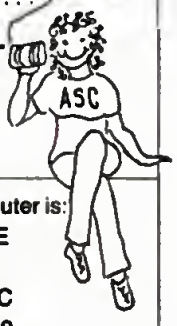

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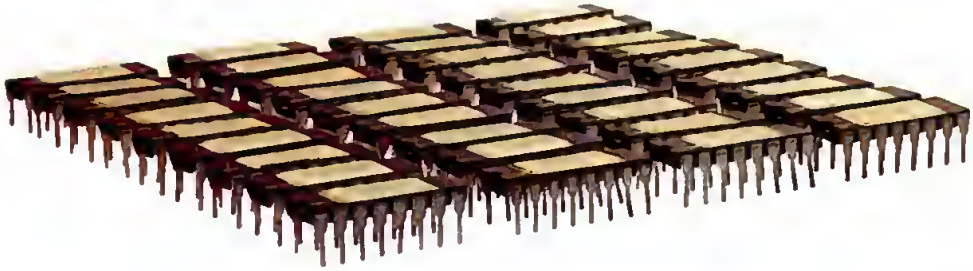

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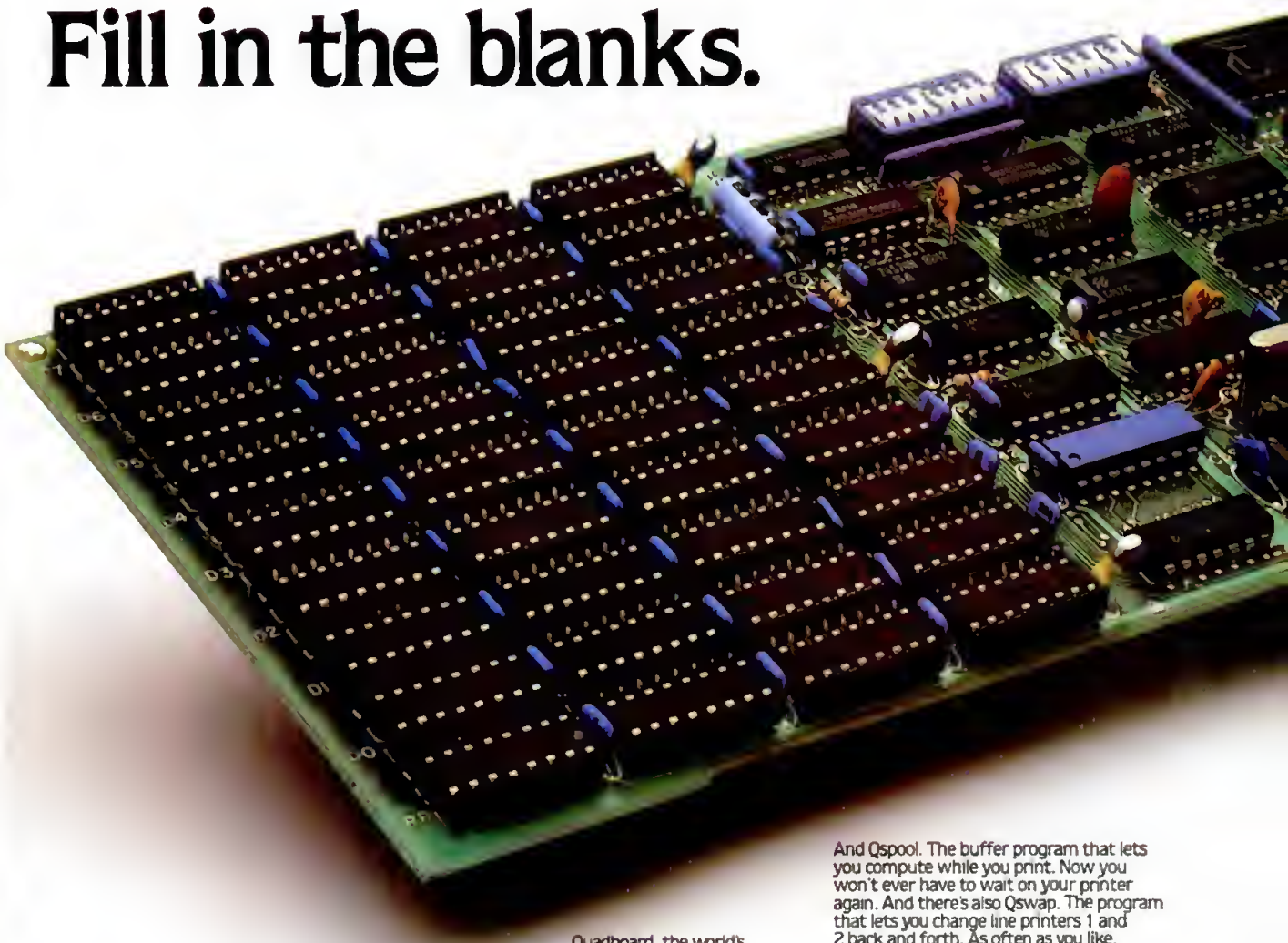

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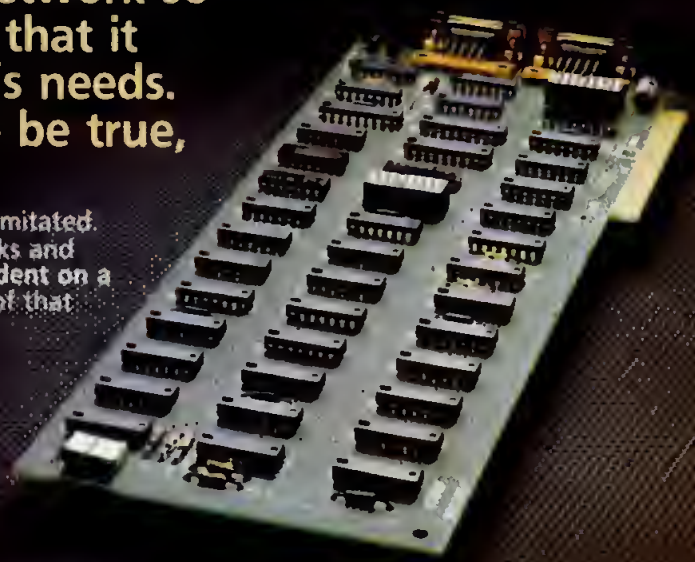

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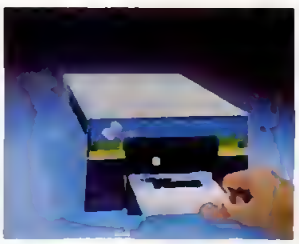

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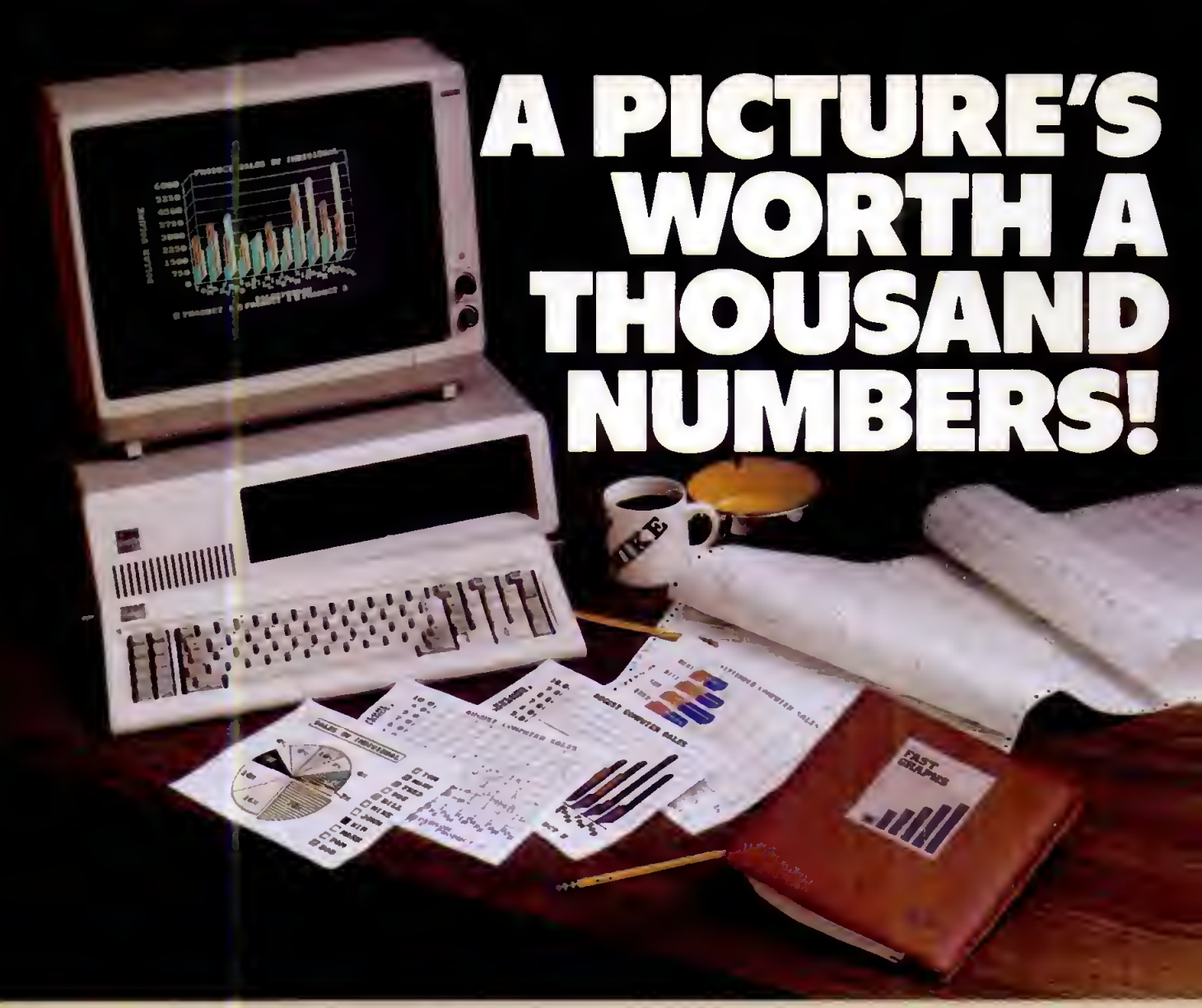

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CIRCLE 649 ON READER SERVICE CARD

Friends, when It comes to text editors, there are no neutrals. And product loyalty? Just try to separate a programmer from his favorite editor. There are backers out there who rue the dey that text editors ventured awey from their line-by-line domains and onto the screen. These loyalists go to heroic lengths to move their fevorite editor to the appropriate machine. For instance, *Mince*—a text editor that allows two files to be open et once through e highly useful horizontal split screen—has a small but fanatical following among PC users, even though the program was officially retired in favor of FinolWord, a word processing program sold by Mark of the Unicorn.

A Short History of the Text Editor

Text edltors for microcomputers were originally simple things devised to help manage the small machine-language programs written by computer enthusiasts. (This was in the Dark Ages of microcomputers—about 1977.) These programs were essentially line-oriented because much of the editing was being done through teletype printers. The editor distributed with PC-DOS, EDLIN (standing for EDit LINe) falls into this category. When Tim Patterson, creator of 86-DOS (the precursor of PC-DOS), first began writing for the 8088 microprocessor chip, which now powers the IBM PC, there were no editors with which to write, edit, and change programs, so EDLIN was written, allegedly in a day or two.

But alas for hackers, by the turn of the decade, screens were here to stay, and a number of the line editors were converted to take advantage of these gadgets and to manage text files larger than available memory.

Fortunately for programmers and professional writers and editors, a number of high-quality text editors did make the transition from the 8-bit CP/M world onto the PC. And if recent developments are a fair measure, the golden age of text editors may be yet to come.

TEXT editors are very compact and are therefore held entirely in memory.

Present-Day Text Editors

Text edltors are distinguished hy several features. They usuelly offer both a "visual mode," which allows full-screen editing of the text, using either function keys, control codes, or a combination of both, and a "command mode," which allows the user to issue powerful if cryptic commands from the command line (et the

A Macro to the Rescue

Macros, the workhorses of text editing, free the programmer from some of the more tedious aspects of his craft.

fn order for a C or Pascal program to compile properly, the command syntax must be correct from the compiler's point of view. Among the rather inflexible requirements is the necessity that curly and square brackets used to show program flow control be placed in the proper position and balanced.

In the small C program listed in the main article, it really is no problem to count the number of opening and closing brackets and make a closer inspection if your addition results in an odd number that indicates either too many opening or too many closing statements.

But in a larger program, keeping track and tracing an imbalance can become a time-consuming, tedious, frustrating experience, particularly if you are leaving your editor, attempting a compilation, and then failing again and again.

The following macro for *PMATE* doesn't solve all the problems, but it does make sure that you have an even number of opening and closing curly brackets before you leave your editor. Tbe macro also illustrates many of the inberent features of the *PMATE* language.

Expanding this macro to include square brackets and other control symbols would be quite simple, and additional macros could be constructed to monitor spelling, syntax, and bracket position, among other factors. Other macros have been created to test for BASIC statements and statement control and even to transfate code from one language or diafect into another.

—T.K.

For more informotion of the use ond swopping of PMATE mocros, the PMATE user group moy be contocted at 318 E. 6th St., #123, NY, NY 10003. Annuol membership is $15 ond includes o monthly newsletter.

```
; Counting Curly Brackets

Ogcounting brackets$    ; this message is displayed on the
                        ; command line during entire operation
0v00v10v20v3            ; variables 0,1,2,3 are set to 0
a                       ; go to the boginning of the text in memory
{                       , begin an iteration loop
    e                   ; intercept error message if { not found
    s{$                 ; search for open curly bracket
  va0                   , increment variable 0 by 1
}                       ; end loop—automatic exit if { not found
(@0-1)v3                ; subtract one from the total (held in
                        variable 0)
                        ; and assign that number to variable 3
@3v0                    ; assign the value of variable 3 to
                        variable 0
a                       ; move back to the beginning of the file
{es}$val}               ; another search loop but this time for
                        the
                        ; closing curly bracket. Variable 1 is
                        used
```

(Program continues)

top or bottom line of the screen). For example, within *PMATE*, the command 15L followed by two hits on the Escape key will move the cursor 15 fines forward. Now the user can press the Insert key on his PC once to enter Insert mode or twice to enter Overwrite mode. Or the Escape key can be pressed again to move another 15 lines forward.

The number of commands offered by text editors usually exceeds the number available for even the most advanced word processing programs. In fact, the keynote of these programs is power and flexibility. Flexibility is measured by the editor's ability to combine and modify commands through the use of variables and special text buffers.

Finally, text editors, by virtue of the fact that they do not contain code to manage print formatting, are very compact and are therefore held entirely in memory. This reduces the amount of space they occupy on the disk and the number of disk accesses required, speeding up botb the editing and writing process.

There are trade-offs, bowever. For one thing, you are not likely to find a text editor that offers a menu to explain nearly every command (à la WordStor) or to give you pretty printing and numbered paragraphs (à ia FinolWord), or multiple, proportionally-spaced columns (à la Spell-Binder), or a menu-driven approach to computer writing (à la Benchmork).

IBM's ENTRY is not, in my opinion, as mature and finished a product as either PMATE or VEDIT.

So, you ask, with the price of word processing programs for the PC below $50 retail in some cases and with the capabilities and functionality of these word processing programs increasing by leaps and bounds, why would anyone pay as much as $225 for a text editor that doesn't even know about letter quality printers?

The answer lies in the combination of speed, simplicity, and power. A quality text editor provides knowledgeabfe users

with the fastest, least intrusive means of entering and modifying text—particularly the special text known as "program code."

Today, many programmers are turning to the C and Pascal structured programming languages because of thair relatively pure nature, power, and portability. In order for a structured program to be quickly comprehensible, programs are written in a special outline form that laans heavily on tabular indents and outdents that are used to show the relationship between the various elements in the program.

Here, as an illustration, is a small C program:

```
/* copy input to output */

main ()
     {
     int c;

     c = getchar();
     while (c != -1
          {
          putchar (c);
          c = getchar();
          }
     }
```

In reading this program—which merely takas a character from the kayboard and puts it into mamory—tha position of tha curly brackets and the various statements make it much easiar for a programmer—even the programmer who wrote the program—to quickly understand what is going on.

A good screan editor will help a programmer create this form of text by making it easy to indent and to adjust the left margin. Furthermore, the program writer—undoubtadly deep in thought—will not need to worry about the tendency of an overly helpful word processing program to flash manus, reform his text, or restrict his margins at every opportunity.

With a powerful screen editor such as VEDIT, PMATE, or the IBM Personol Editor, dealing with the text that composes the sample program above is child's play. One command will set the indent to whatever column you are currently on. Another one- or two-keystroke command will indent four columns, and a third command will outdent four columns. A fourth command will modify the number of spaces each tab occupies, making it easy

(Program continued)

```
(@1-1)v3                ; subtract 1 from the value of variable 1;
                        assign to
                        ; variable 3
@3v1                    ; assign value of variable 3 to variable 1
z                       ; move to the bottom of file
13i                     ; insert a carriage return (^M)
@0=@1{                  ; this is a test. If the value of variable
                        0 aqual
                        ; the value of variable 1 the operations
                        in the naxt
                        ; loop will be performed. Otherwise they
                        will be
                        ; skipped
     t                  ; the point in the text is marked for later
                        referance
     2{                 ; do this loop twice
        qbqd            ; ring bell, delay one second-to get your
                        attention
     }                  ; end loop
iEqual number of opening and closing brackets$
                        ; insert this message on screen$
     }                  ; end loop
@0>@1{                  ; if variable 0 is greater than variable 1
                        ; enter next loop
     t                  ; tag position
     3{qbqd}            ; ring bell three times
     (@0-@1)v2          ; subtract variable 0 from variabla 1 and
                        assign
                        ; to variable 2
     iThere $           ; insert word ''There ''on the screen
     @2=1{iis $         ; IF variable 2 is equal to 1 insert word
                        ''is ''
       }{               ; ELSE
  iare $                ; insert word ''are ''
       }                ; end loop
     @2\                ; insert number containad in variable 2
     i too many opening brackets!$}
                        ; insert rest of sentence
@1>@0{                  ; if variabla 1 is graater than variable 0
     t3{qbqd}           ; tag and ring bell three times
     (@1-@0)v2          ; assign difference between var. 1 and 0
                        to var. 2
iThere $@2=1{iis $}{iare $}@2\i too many closing brackets!$}
                        ;grammar check and message insertion as
                        above
gpress any key$         ; insert prompt on command line, wait for
                        operator
#d-d                    ; delete backward to tagged spot and
                        delete return
a                       ; return to beginning of the file
```

to adjust to an increasingly complex program.

The Big Three

At present there are three major entrants into the screen editor category for the PC:

- *VEDIT*, or Virtual EDITor, is published by CompuView Software Company, a 16-bit systems programming house. The program is very compact and quite powerful with high-quality documentation.
- *PMATE* is published by Phoenix Software Associates, a Boston area software development house specializing in MS-DOS operating systems. *PMATE* includes a powerful built-in interpreted structured programming language that can be used to construct programs to handle special editing tasks or to extend the capabilities of the editor itself.
- *IBM Personal Editor* is a recent entry into the screen editor competition. Very easy to use, *IBM's Personal Editor* offers limited macro capability and several editing buffers for management of text.

Before taking a closer look at these three programs, several comments are in order. Number one: Be Warned! Text editors are not for everyone. For the novice, friendly menus and English-like computer instructions are perhaps essential to learning to use a computer and a computer program. Text editors feature neither of these attractions. Second, *VEDIT* and *PMATE* are so similar in their editing operation that there will be some unavoidable overlap in describing their features. Third, IBM's entry, *The Personal Editor*, although promising both from its price and its simplicity, is not, in my opinion, as mature and finished a product as either *PMATE* or *VEDIT*. Therefore less time will be spent describing its features.

VEDIT IS front-runner for the definitive quality screen editor.

VEDIT, CompuView's Virtual Editor

VEDIT is front-runner for the definitive quality screen editor. Though *VEDIT* lacks some of *PMATE*'s unique properties, the program compensates in several ways. *VEDIT* has a superior, example-filled manual designed to help the text editor newcomer take better advantage of its many features. The program is tiny. It occupies only 16K. Finally, *VEDIT* costs less than *PMATE*.

CompuView claims that programmers are able to reduce their editing time by 30 percent when using *VEDIT* rather than high-powered word processing programs. In addition, *VEDIT*, like *PMATE*, offers full customization to the user. This means that a person in the habit of using, say, *WordStar* or *Easy Writer II* commands can easily modify *VEDIT* so that the same key-

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strokes have the same effect on both programs. For example, you can set both your Up arrow key and Control-E to move the cursor up on the screen.

In addition, *VEDIT* (and *PMATE*) offer 10 "registers" or buffers for on-line storage of additional files, for notes or discarded portions of text, for use with cut-and-paste operations, or for storage of long strings of commands known as "macros." Using macros, which are actuelly small, compact programs that string together commands to the text editor, *VEDIT* can perform compliceted operations both on the files in memory and those on the disk.

For example, moving a block of text into a buffer for later use requires only two keystrokes plus the cursor motion. With *PMATE* you move to either the beginning (front) or end of the block you wish to move, and type a control code such as Control-T (T for Tag); you then move to the other end of the block and type Control-E (for End). The contents are automatically moved to e speciel buffer. If you would have preferred to copy the block of text rather than move it, you simply type Control-Z (for Zap). Now you heve the block both in your current text end in the speciel buffer. You can move to enother point In the text and press Control-Z again. Each time you do so, the contents of the special buffer are inserted at the cursor position.

PMATE offers line-by-line control for use within its buffers.

One of the satisfactory things about e powerful editor is that there is usually more than one wey to eccomplish the same goal. Another way to move text in eny of our three text editors is to retrieve it from the garbage stack. With *PMATE*, for example, you can use Control-End key combinetion to delete e line. Having removed one or several lines that way, you can go to another point in the text or to another buffer and use *VEDIT*'s Undo command or *PMATE*'s Pop command (depending, of course, on what editor you are using) to retrieve the deleted lines beginning with the letest deletion. Whether you are deleting lines, words, characters, or paragraphs, the *P*op command will retrieve them up to e maximum "garbage steck" size edjusted to suit your own needs.

VEDIT has considerable line-oriented power. A command such as EGFILENAM [13,300] will insert lines 13-300 of a file on disk into the edit buffer et the cursor position. This is particularly handy for editing BASIC and other programs with line numbers.

PMATE offers similar line-by-line control for use within its buffers. For example, the command 5b4m moves 5 lines starting at the cursor position to buffer number 4. -5b4m does the same thing,

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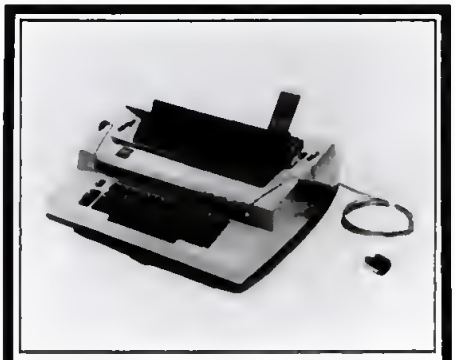

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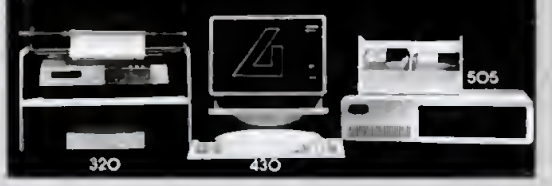

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except that the lines are counted backward from the cursor point. 5b4c copies five lines, leaving them in both places.

PMATE offers the programmer the ability to change the mathematical operations from the familiar decimal calculations to hexadecimal, octal, binary, or whatever.

Other options allow you to append text to a buffer, to merge a buffer with files, or to empty the buffer before moving new text into it.

VEDIT also offers powerful "search and change" functions. Wildcard characters can be inserted into a string. For example, Sjoi will find joe, job and joke. A literal command such as s^N! will find the vertical bar character as well. *PMATE*'s search and replace features are more powerful, adding a "not" capability that allows searching for anything but the following, as in s^Nsing to find ring and thing, but not sing and to match any terminator (smoney^W will find money., money manager and money" but not moneylender).

Another feature of *VEDIT* is its capability to set up to 10 markers in the text for reference purposes. This is useful for finding a spot in the text or program after you have saved the file to disk.

Personal Editor

The *IBM Personal Editor*, introduced this spring, is a screen editor that, unlike *PMATE* and *VEDIT*, has neither CP/M-86 or an 8-bit counterpart. It is entirely Big Blue's Baby. The main selling point of *Personal Editor* is that great attention has been paid to the design of the program. Of the three editors reviewed here, it is probably the easiest to master.

There are four internal files of buffers: the editing buffer, the directory buffer, a keystroke buffer named KEYDEFS, and an "Unnamed" file, which saves the last five changes made with the editor—your basic UNDO function. Up to 20 files may be held in memory at one time. This is particularly convenient if you have a large on-line memory (say 512K) or if you need to manipulate many files at once. As with the other two text editors, there is a macro facility for stringing commands together, but it is limited to 250 characters—a rather severe limitation.

The writer(s) of *Personal Editor* have built in a number of safety features. For example, you cannot erase a file that exists in one of the 20 editing buffers if you have made any changes in it without assuring the editor that you really do want that file erased from memory. Unfortunately, the current version of *Personal Editor* is a little too line-oriented. Another example: Altering a line that is too long is a three-step process. Putting separate lines together requires employment of a "join" function. The reason for all this is that *Personal Editor* is apparently putting a hard carriage return at the end of each line. Unlike *PMATE* and *VEDIT*, *Personal Editor* has only limited provisions for word wrap or reformatting of the paragraph or document through global commands.

PMATE

PMATE has been under nearly-continuous development for four years. What began as a limited, line-oriented editor has become one of the more unique packages available for the PC. In addition to its 10 text buffers, *PMATE* provides for more than 70 "permanent macros"; these are user-written programs that are tested and debugged within *PMATE* and, when perfected to the satisfaction of the user, made a permanent part of *PMATE*. (See sidebar for more detail on macros).

THE IBM Personal Editor is entirely Big Blue's Baby.

In order to give the user the greatest possible latitude in the development of these macro programs, *PMATE*'s author, Mike Aronson, has expanded its command syntax to the point that it qualifies as a computer language of its own and one particularly well-suited to the manipulation of text.

Included in the language are the single letter commands used in *PMATE* such as W (for word), P (paragraph), C (character), L (line), D (delete character), K (kill line), A (go to top of text in memory), Z (go to bottom of text), I (insert the following), F (format screen width and word-wrap), S (search for the following), C (change the following to) and T (tag position). Numeric arguments may be placed before these commands. While the general motion of these commands is forward, if they are preceded by a minus sign, the movement and changes will occur in reverse direction.

PERSONAL Editor is apparently putting a hard carriage return at the end of each line.

In addition, *PMATE* provides for a full complement of arithmetic operations including add, subtract, multiply, divide, and a number of algebraic operators such as logical or (!), logical and (&), logical complement ('), less than (<), greater than (>) and equal to (=) operations. Parentheses are also used to differentiate operations such as 3 + 2/3 from 3 + (2/3). These parentheses can be nested up to 15 deep!

In addition, *PMATE* offers the programmer the ability to change the mathematical operations from the familiar decimal calculations to hexadecimal, octal, binary, or whatever. Thus, if the binary option is set, the answer to the problem 4 + 5, displayed instantly on *PMATE*'s command line, will be 1001. If the octal flag is set, the answer will be 11.

There are also powerful iteration and control statements that programmers will recognize as Boolean operators. These include such operations as "do if x is true," "if x is true do this, else do that,"

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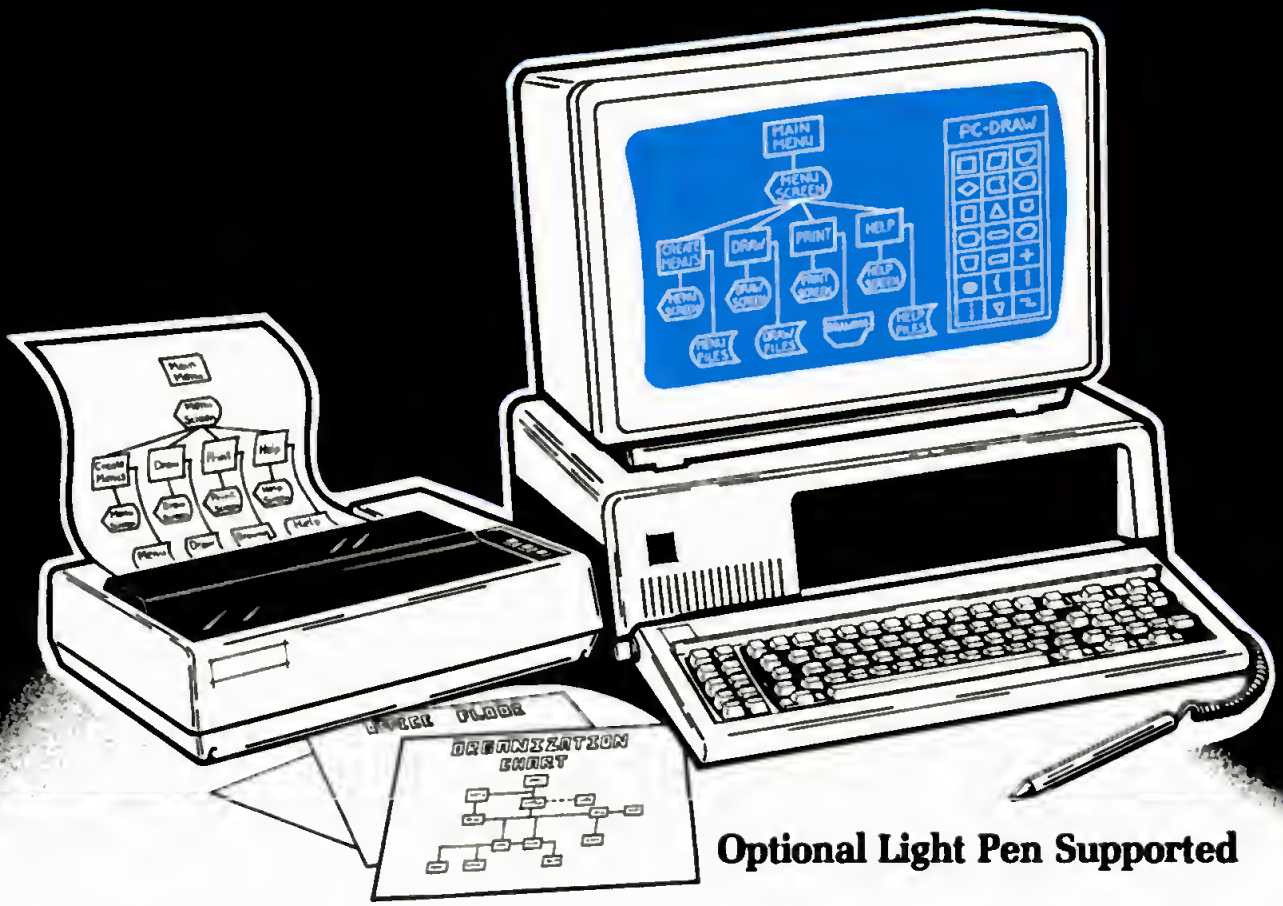

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"do this x times," "do this until x condition is fulfilled," "go to tha beginning of the loop if x is true," and "go to the next loop if x is trua." Thare ara also Set and GOTO commands. In *PMATE*'s cryptic style, these Iteretion and control statements are invoked with singla symbols: Opaning and closing curly and straight brackets.

PMATE elso has 10 variablas that can ba used to great advantege. Eech varieble can be sat to eny valua below 65,000 (including a value set by anothar variabla) and each can ba incremantad and pushad onto *PMATE*'s number stack.

The ability to install macros you have written onto *PMATE* gives the savvy user the ability to transfer nearly any ettractive operetion from enother text editor to the *PMATE* macro library. For example, the highly regardad word processing program *Palantir* (See "The Wizardry of Palentir" in this issue) allows you to tag a location with one kaystroka and than dalate to the naxt character struck. For exampla, I could mark this spot and then press the period to delete to the end of the sentence. That's a hendy feature. After a few minutas of thought and several hours of work, I wes eble to permanantly add this "set end delete" feature to my *PMATE* repartoire. Now I use it all the time.

TEXT editors aren't what everyone needs or wants.

One other feature of *PMATE* that should be mentioned is its limited text-formatting cepebilities. With embedded commands, speciel left end right margin end tab settings mey ba placed at different places in the taxt. This is usaful for constructing tebles or progrem modules. I use it frequently to reduce the right and left hand mergins of tha taxt on screen when I am editing. It is also Indlspensable when you are sending text from *PMATE* directly to a printer, since what you see is quite literally what you gat.

You may ba asking yoursalf, "Should I invest in a taxt aditor?" My reaction would be thet taxt edltors aren't what everyone needs or wants. Speeking personelly, as I heve throughout, I can edit text fastar then enyone I know using my personalized text editor. As a professional editor, this is important to me. Using the program's macros and structured programming lenguage hes given me great editing power end e much greater understanding of a truly powerful language like C. And my editor is completely trensportable and adjustable throughout CP/M and PC-DOS, for both 8-bit and 16-bit computers. Since I have to chenge the machinas I am working on frequently, this is the clincher. In case you haven't noticed, I'm sold. */PC*

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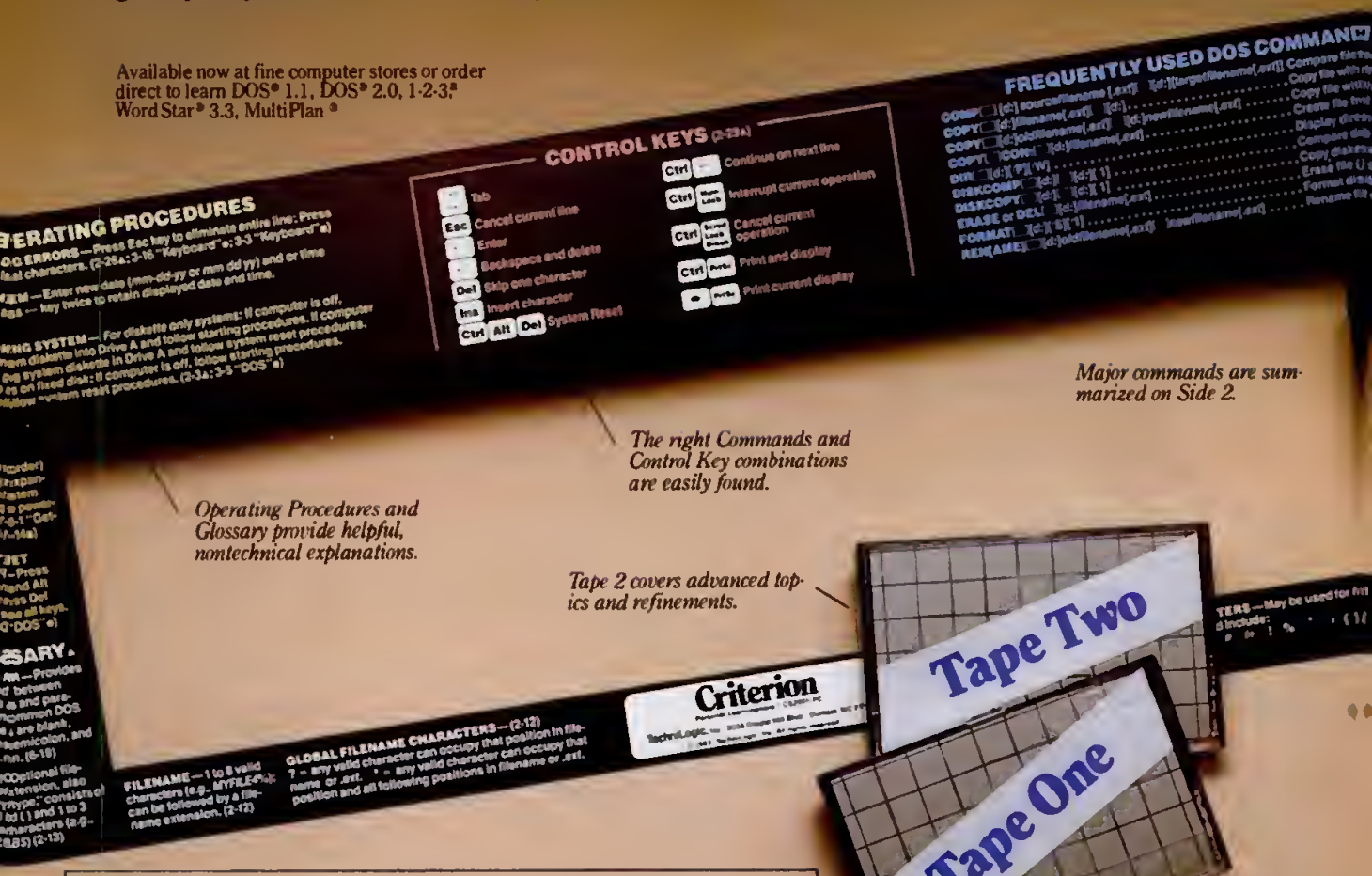

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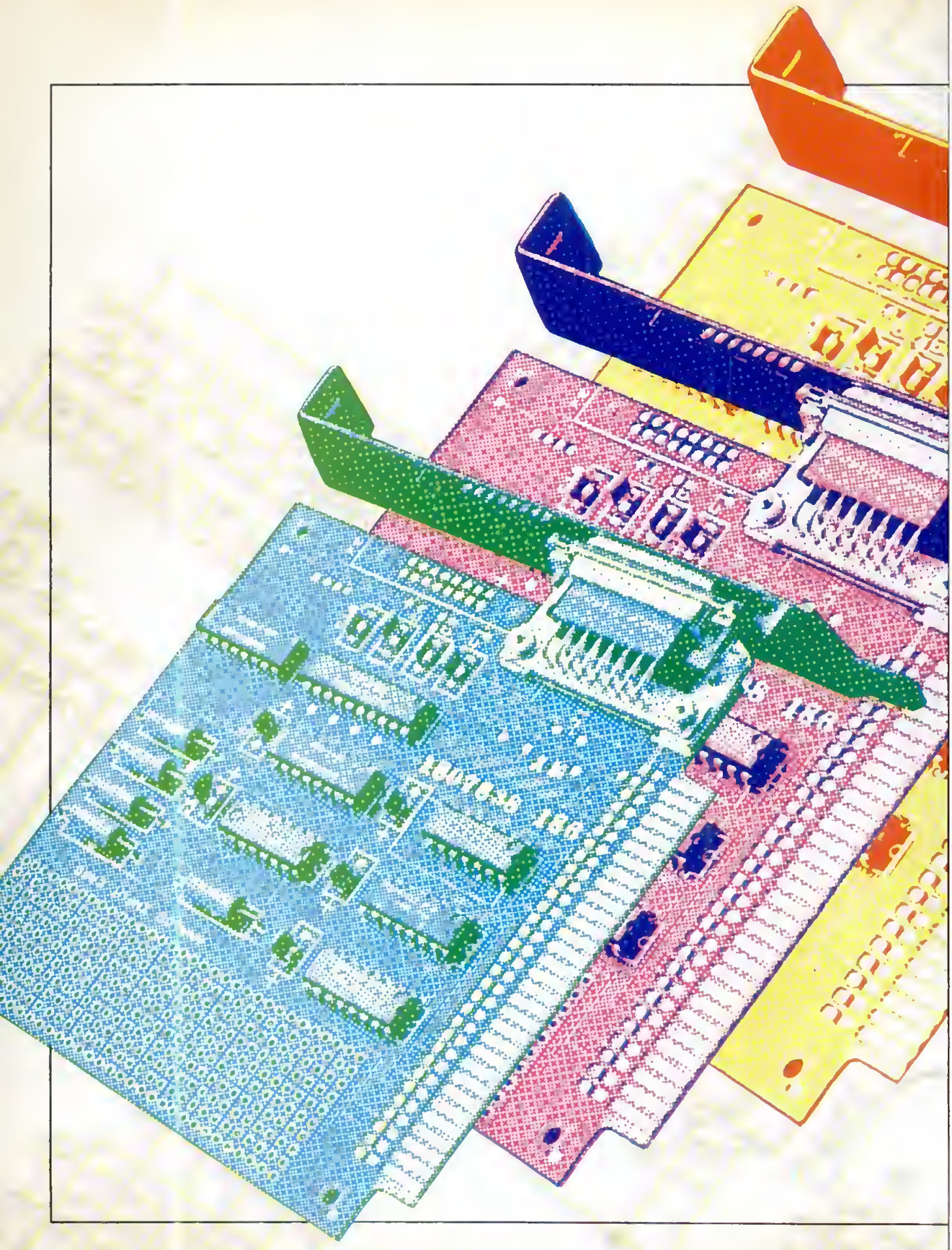

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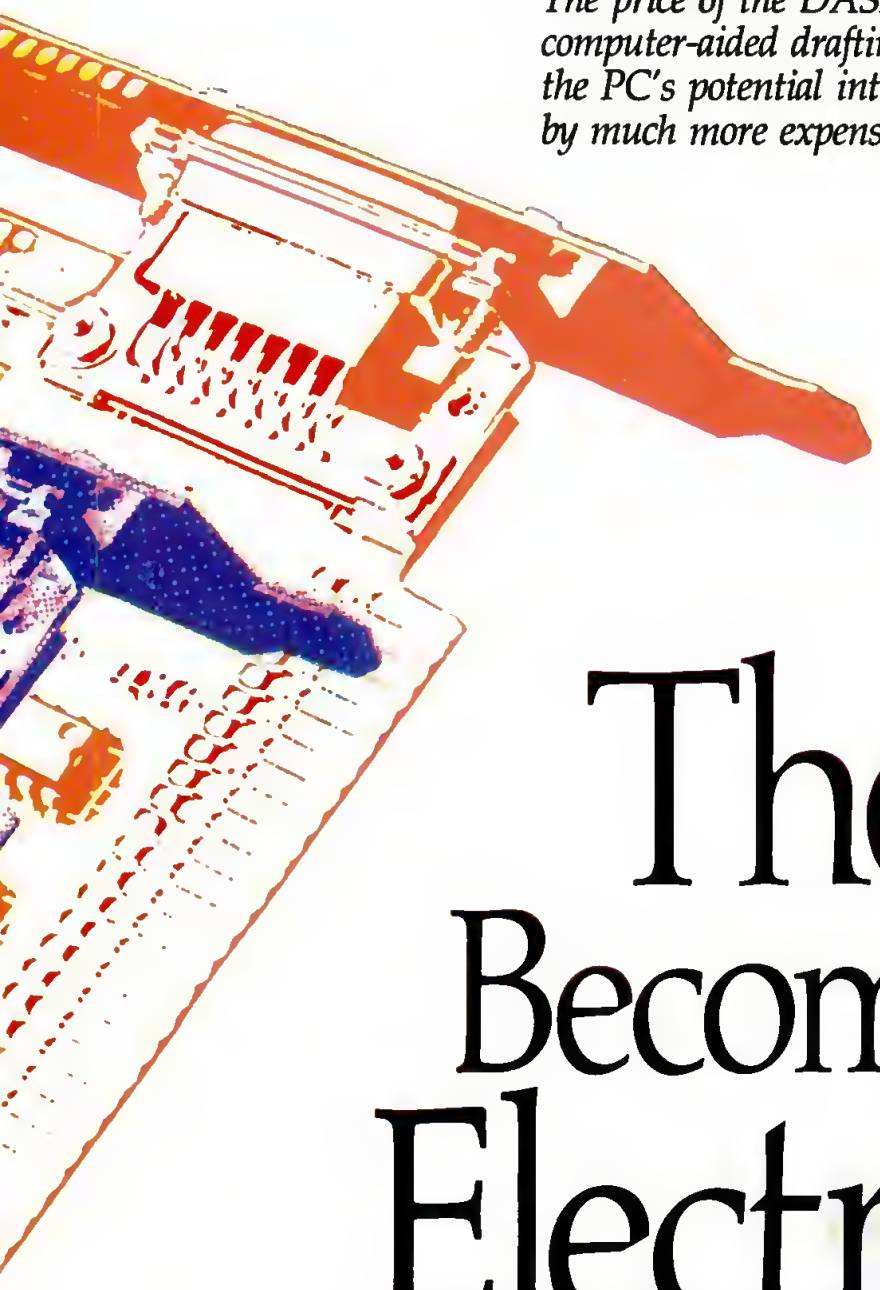
The price of the DASH-1 may seem high, but this computer-aided drafting design system has extended the PC's potential into areas previously charted only by much more expensive systems.



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DASH-1
FutureNet Corporation
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TWX: 910-494-2681
List Price: *DASH-1* $5,980 to $12,960, *DASH-1XT* $6,280 to $14,955 (price depends on how much of the required equipment is supplied by FutureNet).
Requires: 256K, two double-sided double-density disk drives, printer, IBM monichrome monitor.

CIRCLE 616 ON READER SERVICE CARD

I have worked with a full blown computer-aided drafting and design (CADD) system before—the ComputerVision system at Litton Poly-Scientific. That system is truly amazing for what it can do, but at times it can be extremely slow, especially when working with schematics.

When I was first asked to review a smaller CADD system that produced schematics with the PC, I was very skeptical and expected to find a product that was awkward and even slower than the ComputerVision system. Boy, was I ever wrong! The *DASH-1* was fest and very easy to use. (*DASH* stands for "Design Aid Schematic Helpmate.") To top it off, the schematics and screen graphics (on my monochrome display) were great. The *DASH-1* and *DASH-1XT* are powerful tools that creete, edit, print, and store schematic drawings.

There are basically two configurations of the FutureNet system. The *DASH-1* works on the PC and the *DASH-1XT* works on the new PC-XT. You can buy

THE insertion of symbols is fast. It takes about 1 second to insert a 8086 microprocessor.

either a whole system from FutureNet or, if you already own a PC or PC-XT, then you can buy just the additional software and hardware needed. The integral parts of the package (in addition to the comput-

Figure 1: *The DASH-1 system in use with mouse and C.Itoh Prowriter printer.*

er) are a graphics interface board that converts the monochrome display into a graphics display, a mouse for cursor movement and entering schematic connections, and the software (see Figure 1). The system is designed to work with either the wide or narrow carriage C.Itoh dot-matrix Prowriter I and II, but will also work with the Epson MX-80, MX-100, and the Okidata 84 printers.

Possible Applications

I can think of three types of users who might be interested in the *DASH-1* concept. First, a large company that already owns a large CADD system, but is hampered by the slowness of entering schematics. To speed up the process, the FutureNet package can be used to create and edit schematics. The pin list or netlist can be uploaded to the mainframe CADD computer for "autoplace" and "autoroute." All the information needed to place and route a printed circuit board is included in the *DASH-1* pin list. FutureNet offers a program called VTERM (list price $195) that turns the PC into a VT-100 terminal so that you can hook your PC up to the big CADD system.

The second group of potential buyers would include a smaller company that cannot justify purchasing a full CADD system, but has a real need for computerized schematic design. The *DASH-1* system would meet all of the company's needs for schematics and provide a powerful general purpose computer for other jobs as well. The last group includes the consultant or engineer who wants to be able to work with schematics more efficiently and professionally. If someone already owns a PC, the additional investment is small compared to the benefits he might derive from the *DASH-1* system.

The package already includes a library of symbols of parts that will probably take care of 85 percent of a schematic designer's needs. These symbols range from discrete resistors, capacitors, and switches, to more complex parts like microprocessors (including the 8048, 8085, 8086, and 8088) and their peripheral chips. Practically the entire 7400 family is present, including DeMorgan equivalents for most of the logic gates.

If a part you need is not in the library, you can create your own symbol for it with the Symbol Definition commands. Figure 2 is a schematic I designed on the IBM Game Control Adapter that is shown in IBM's Technical Manual. I will be referring to this schematic throughout the review to illustrate the many commands and capabilities of the system.

Graphics Quality

As you can see, the quality of the schematic printed using my C.Itoh Prowriter-I is good, probably better than you can do by hand. The screen graphics are also surprisingly good. Figure 3 shows a picture of a screen display of a portion of another schematic. The lines and text are clear.

The insertion of symbols is fast. It takes about 1 second to insert a 8086 microprocessor; to insert a component as complex as that on the ComputerVision CADD system could take as long as a minute if it was in full use. Moving and copying components or sections of a schematic can be just as fast—about 2 seconds for a section.

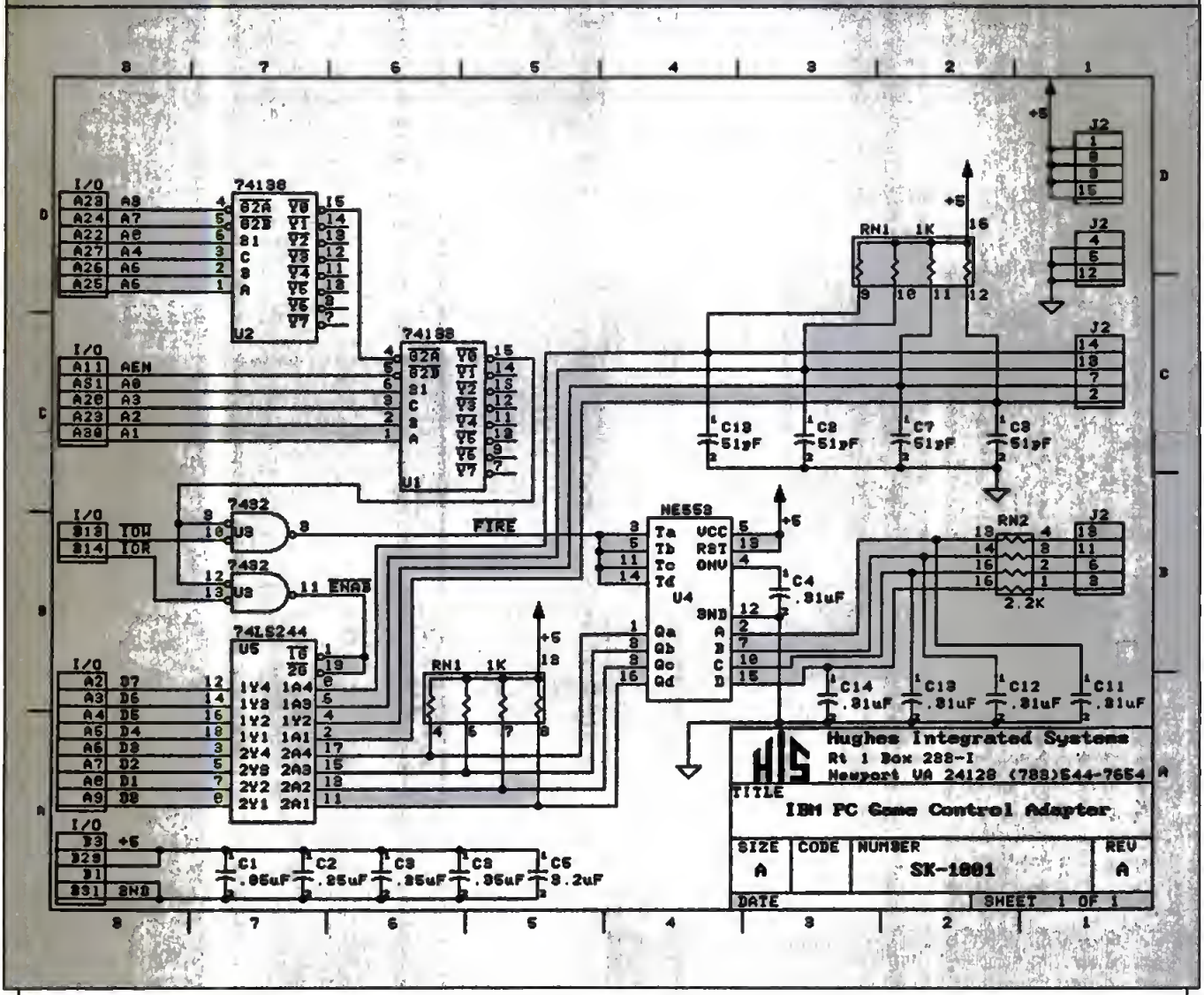
One of the reasons that *DASH-1* is so fast is that you can view the schematic in only two sizes—COMPRESSED, where you see the entire drawing no matter what size has been selected; and FULL, which blows up a section to a completely legible size. Large CADD systems allow you to select any size of display using zoom commands, but that is part of the reason the big systems are slower; they have to calculate all the new dimensions each time the screen is changed. The *DASH-1* dimensions are already calculated beforehand, so changing back and forth between FULL and COMPRESSED displays is quick.

The only task that takes more than a couple of seconds is printing; copying the screen display in Figure 2 took about 1 minute, 35 seconds, and a printout of the drawing (an A-size schematic) took 3 minutes, 40 seconds to print. You can select only three different sizes of characters for labeling and only four different types of lines (normal, thick bus lines, dotted, dashed). These choices are plenty, however, for most work. Since there are fewer variables for the computer to have to recalculate frequently, the payoff is a system that responds quickly.

A LIBRARY of symbols of parts will probably take care of 85 percent of a schematic designer's needs.

Figure 4 is an example of the COMPRESSED display mode; notice that the lettering and labeling are not shown since they would not be legible at that scale anyway. Only a section of the game adapter schematic in Figure 2, however, could fit on the screen in FULL display mode. The

Figure 2: A schematic diagram of the IBM PC Game Control Adapter, produced using the DASH-1 system.



dots around the components designete the symbol's bounderies. The smell box with the cross hairs in the middle of the screen is the grephics cursor.

The very center of the screen is the graphics area. Along the top and bottom of the screen are the numbers 1 through 8 and along the sides are the letters A through D; these numbers and letters are used for sectioning reference.

On the right side of the screen is the stetus column in which there are 12 different stetus fields (see Figure 4). The top one is for the current Mode: FULL, COMPRESSED, ALPHA, or SYM. ALPHA mode is used when text is being entered for pin nemes, signal nemes, pin numbers, references, etc. SYM mode is for symbol definition.

The LINE, CHAR and ATTR status indicetors ere for line width, character height, and ettribute status, respectively. Attribute status tells the program whether the next text being entered is a pin number, circuit designetion, part number, component value, signal name, drawing title, drawing number, drawing revision, drewing pege, drawing date, non-printing ground or power connection, or any other attribute that you wish to define. The 0 shown in Figure 4 is the default ettribute, which represents extraneous text for labeling something—dete thet you do not want to go to the pin list.

The next six fields are position and size status indicetors. The XLOC and YLOC show the current position of the graphics cursor with respect to the top left corner (0,0). SYMW and SYMH tell the symbol width and height of the symbol currently pointed to by the graphics cursor. The size of the drewing currently selected is shown by DWGW and DWGH. All the size end location indicators are based on whet FutureNet calls a "displey unit." A display unit is .05- by .05-inches and is approximetely the same size on the printout. The next to last stetus field shows which attribute hes been assigned to the text thet the grephics cursor is presently pointing to. The last status indicator on the bottom always shows how much RAM is left in your system.

The one area not yet mentioned is the bottom line wbere in Figure 4 you see the command cursor. This area is called the command line where the user can enter

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Figure 3: A schematic produced by the DASH-1 as it appears on the monitor's screen.

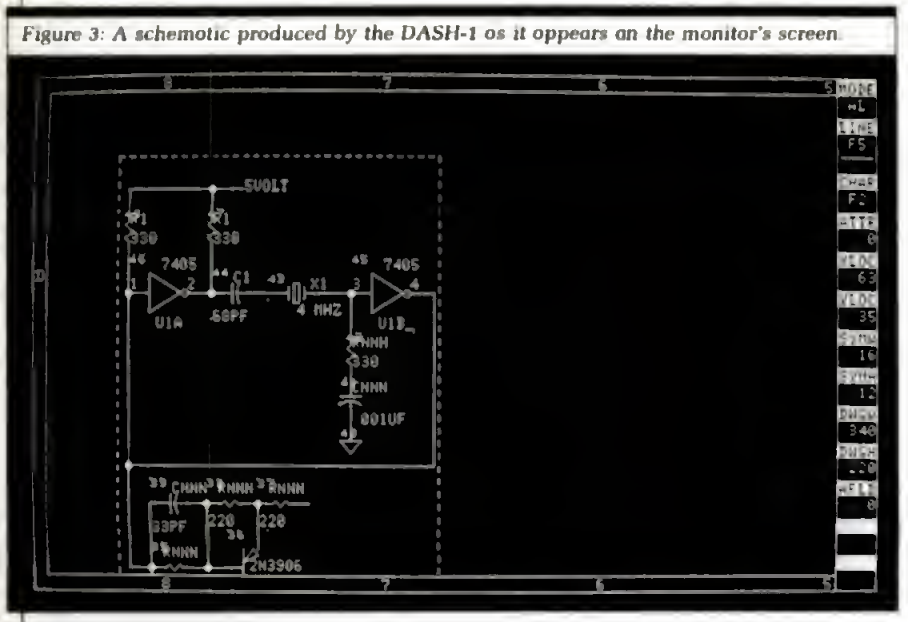


Figure 4: The schematic of the Game Control Adapter as seen in the DASH-1's COMPRESSED display mode.

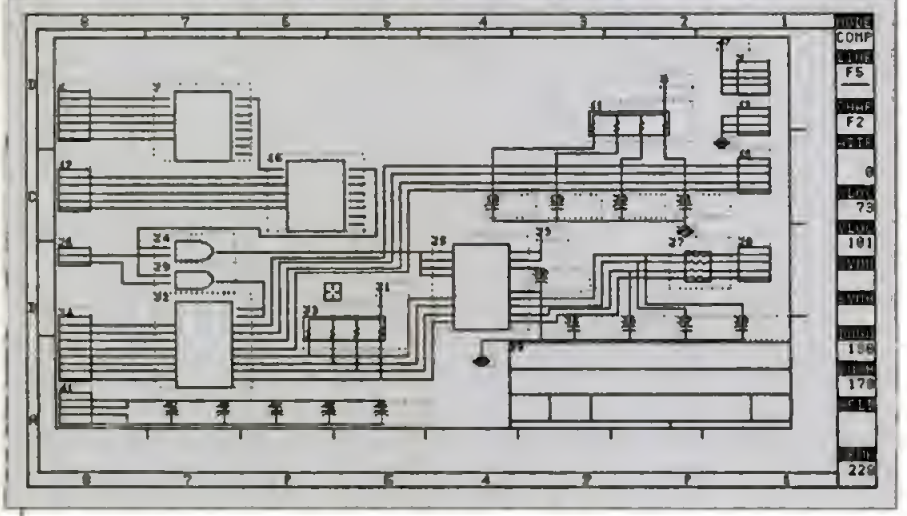


Figure 5. A table of drawing sizes in inches and on the .05-inch square display units used on the DASH-1 system.

The IBM Game Control Adapter

Size	In Inches		In Display Units	
	Width	Height	Width	Height
A	11	8.5	198	170
B	17	11	308	220
C	22	17	396	340
D	34	22	812	440
E	44	34	792	680

various instructions to create and edit schematics and symbols.

Types of Commands

There are eight major command groups: Executive, Cursor Movement, Symbol Editing, Line Editing, Alphanumeric Editing, Area Editing, Mouse, and Symbol Definition. The four editing command groups are all very similer in function except for the prefix notation that selects what the command acts upon. For example, the T command means to Target an item for copying or moving. With a "." in front of the T, the command means to target a symbol; /T means to terget a line, "T means to target some alphanumeric text, and {T means to target a schematic aree.

Executive Commands

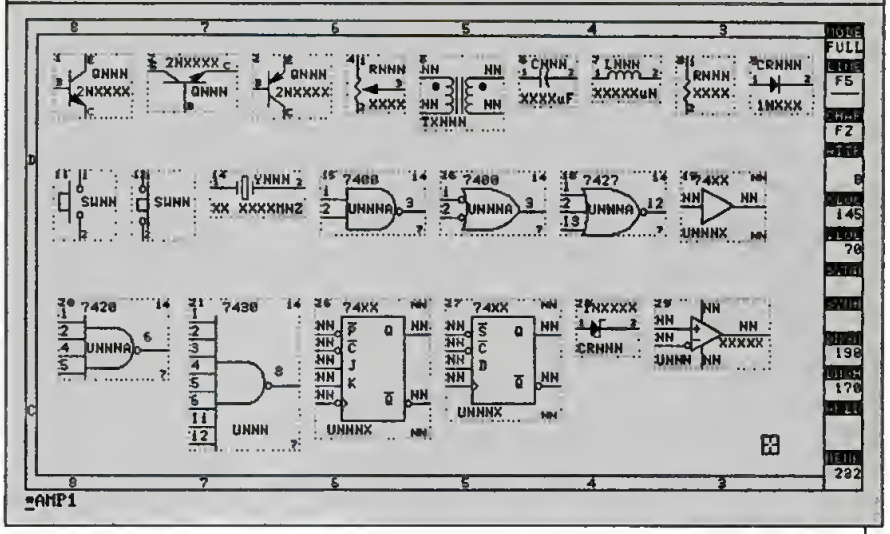
The executive command group allows you to LOAD, SAVE, and PRINT schematic drawings. When printing a schematic, you have several options you can choose to customize the schematic to your printer. You select the "O" option for en Okitdata 84, the "E" option for en Epson MX-80 or MX-100, the default is the C.Itoh printer. If your printer has a narrow carriage (80 columns) you have to select the narrow option ("N"). The "C" compressed selection causes the schematic to be printed half the normal size.

THE MOUSE command activates/ deactivates the mouse hand control for cursor movement and line insertion and editing.

You also can select which strip of the schematic to print. Each strip corresponds to an 11-inch wide (8-inch for narrow mode) section of the schematic. This means that with a wide carriage printer, you can print A and B size drawings in one strip, C and D size drawings in two strips, and an E size drawing in 3 strips. The disadvantage to the FutureNet system is that you have to tepe these strips together to make a complete drawing. This is not reel-

ly that big a disadvantaga and can be avoided if you use multiple page schematics of B size or smaller. The SIZE command selects what size drawing you want. You can choose A through E or select your own dimensions up to 50- by 50-inches. The actual drawing sizas and thair equivalent display units are shown in Figure 5.

Figure 6: Some af the parts available in the symbol library provided with the DASH-1 system.



THE MOST important quality of a design system is the capability to quickly insert and modify schematic components.

As you can see by comparing tha two sides of this table, tha display units are not exactly .05-inch square, but they coma out so that the drawing size matches the dimansions in Figure 5. I am surprisad that the capability of driving ona of the many available IBM-compatible plotters is not includad in this packaga. If you do use a C.Itoh printer, pressing the PrtSc key on the keyboard initiates a screan dump to the printer; Figure 4 is a sample of the printout you recieva. The PgUp and PgDn keys take you to FULL and COMPRESSED mode respectivaly.

If you want to claar tha screen and start a schematic over, the ERASE command will do that task for you. Tha MOUSE command activates/daactivatas the mouse hand control for cursor movemant and line insertion and editing. WRITE creates an ASCII formattad fila that contains all the connections, signal names, pin numbers, component values and numbers, drawing information, and so forth to upload to large CADD system for furthar circuit processing. Tha pin list, which is created by the WRITE command, is important for CADD applications. Tha last Executive commands are thosa that allow you to quit: Q, QUIT, and SYSTEM.

Cursor Movement Commands

There are three ways to mova the graphics cursor around tha drawing: tha mouse, cursor direction keys, and "GOTO" references. The mouse is a mechanical/electrical device with a ball bearing on the bottom of it. When you move the mousa in any direction, the ball bearing movas in a corrasponding direction, and electrical signals are sent to tha FuturaNet graphics board telling the system which way the mouse is moving. The system then updates the screen accordingly. The *DASH-1* I reviewed used a Hawlay mouse (X063X Mark II), but Terry Zimmarman of FutureNet said that the company was trying several vendor's versions of the mouse to see which one works tha best.

The second way to mova the cursor is to usa the Up, Down, Left, and Right arrow keys. The cursor moves one display unit at a tima in the direction salected. You can move any number of units at a time if you anter that number on the command lina first and then press an arrow key.

The last method of cursor movement is the rafarance mode movement. You can enter "A1" through "D8" at the keyboard and move to the position on the screen corresponding to the reference letters and numbers on the sides of tha screen, as shown in Figure 4. You can also move to any component in the schamatic by entering an "N" and tha componant's rafarenca numbar. Evary symbol entered into tha drawing is assignad a reference number in sequenca. Tha 13th symbol entered is assignad tha numbar 13, and the cursor can jump to that part by entering "N13." The *DASH-1* also keeps track of your last ten cursor positions. By using the Tab and Shift-Tab, you can move forward and backward through thosa last tan positions.

Symbol Editing Commands

The most important quality of a dasign system is tha capability to easily and quickly insert and modify schematic components. It should also hava a larga and comprehensive library of parts and offer you the ability to add parts that are not presant. The *DASH-1* system has a very good library that includes almost all the discreta components and most of tha popular integratad circuits (ICs). Figure 6 shows many of tha diffarent types of components already included in the systam library displayed.

A component has to be targeted before it can be moved, copied, or erased.

To list the parts in a library, you enter .DIR; .DIRPR will print tha directory of parts on the printer. The *DASH-1* systam always allows you to insert parts from the system library and ona other users dafined library if desired.

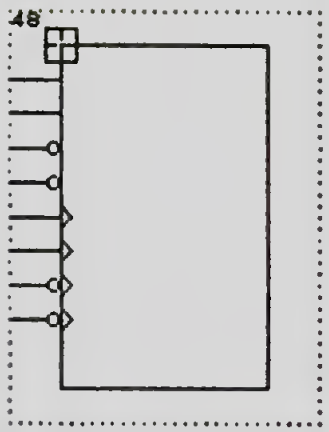
The rest of the Symbol Editing com-

mands allow you to insert or load (.L) a part from a library, target a componant (.T), cancel tha current symbol target (.K), move (.M) or copy (.C) a component, end erase a componant from the drawing (.E). A component has to be targeted with a T command before it can be moved, copied, or erased.

There are several Symbol Editing commands that provide an easy way to create a simple rectengular component symbol. The ".B w,h" command creates a block symbol that can be edited to be tha diagram of an IC. The width end height of tha symbol boundary is defined by "w" end "h" respectively. Tha actual IC block is insida tha symbol boundary to leave room for the "pin stubs" end the pin numbering and symbol text. A symbol tharefore is slightly larger than the actual component outline to ellow for the extra lettering end numbering.

An example of a simple IC component being created is shown in Figure 7. Notice the short lines inserted between the IC block and the symbol boundary. These are the pin stubs, which represent the IC pins to which ell other schematic interconnections must be connectad. You can enter normel pin stubs (.-), inverted signal stubs (.-0), clock signal stubs (.>), and invertad clock signal stubs (.>0). An example of each of thasa is includad in Figure 7. The .D command erasas any pin stubs you do not want. Simple rectangular IC symbols and other more difficult components can also be created by using tha Symbol Definition commends.

Figure 7: New symbols representing ICs not supplied in the symbol library con be created using the Symbol Editing commonds. Starting with the blank outline of the IC, short lines ore added to represent the chip's pin stubs. The four ovoilable types of pin stubs ore included on the left side of this chip: From top to bottom the pin stubs ore normal, inverted, clock, ond inverted clock.



LINE insertion and editing is quick and easy with the mouse.

Line Editing Commands

After you hava inserted some components, you need to connect tham togathar. Tha Line Editing commands giva you that capability. Using the function kays F5 through F8, you can choose normal sized line segmants, thick line segments for bus lines, dotted lines, and dashed lines. Tha Line commands are all prefixed with a slash (/) and depend on where the graphics cursor is before the command is entered.

To enter a line between pin 6 (G1) of U2 and A22 of tha I/O port shown in Figure 8, you would first position the graphics cursor on the U2 symbol boundary evan with pin 6 and then enter /L; notica tha dashed lines (indicating valid line directions) projecting horizontally and vertically. Then you would mova the cursor horizontally to the left to the I/O port symbol boundary next to A22. Finally, you would press the return kay sinca /L should still be on the commend line and is effectively entared again.

Mouse Commands

Tha Line commands can be used to make all interconnections, but the mouse can do this job much faster. Instaad of entering Line commends at the kayboard, you just press ona of three buttons on the mouse for the same result. Pressing the left button is the same as entering a /L commend. The middla button insarts/delates interconnecting dots—it also repositions tha screen display if it is pressad when the graphics cursor is located at the edge of the screen. Tha right hand button is the /E command for erasing line segments.

Now, to insert the line from pin 6 of U2 to A22, as shown in Figure 8, you simply position the cursor at pin 6, press the left button on tha mouse, mova the cursor to A22 and press the left button again. No commands need to be entered at tha keyboard. Line insertion and editing are quick and easy with the mouse. I found that I could create a schamatic much faster than I thought possible after e few hours of practica with the mouse.

Alphanumeric Editing Commands

Once you hava inserted the componants and made ell tha interconnects, tha next step is to label everything using the Alphanumeric Editing commands. These commands all start with en apostrophe. As with Symbol Editing, there are commands to target ('T), move ('M), copy ('C), and erasa ('E) alpha fialds.

Alpha fields are the areas of taxt labaling that defina pin numbers, IC reference designetions, component part numbers and values, signal and pin names, etc. There is a small boundary around these alphe fields similar to the boundary around the symbol blocks. The boundaries must not overlap; they have an important meaning for pin and signal names. The alpha field boundary of the signal nama must touch the lina segment for it to be associated with the line. Similarly, the boundary for the pin number must hava its boundary touch the pin stub to correctly identify the pin number with the pin stub.

ALPHA fields are the areas of text labeling.

Normally the alpha fiald boundaries are not displayed, but entering the 'B command toggles the alpha boundary display on and off. Another toggle command, 'D, enables/disablas the display of the alpha attribute display. Figure 9 shows the alpha ettribute display screen, the elpha field boundary display screen, and the normel screen.

Each alpha fiald entered must hava an ettribute essigned to it to determine what the text being entared is supposed to represent: pin number, component number,

component reference, component value, signal name, drawing number, drawing revision, or drawing date. These attributes are very important to the pin list and net list; they enable larger CADD systems to use the *DASH-1* information to "auto-place" and "auto-route" printed circuit boards. The 'A command assigns the correct attribute to the alpha text being entered next.

Figure 8: The Line Editing commands are used to draw a line connecting points in a schematic diagram. In the first drawing the graphics cursor is at pin 6 of chip U2. This location is marked by entering /L, the graphics cursor is moved over to the other end of the connection—A22 on the I/O port. After marking this destination with the /L command, the complete line appears, as shown in the second diagram.

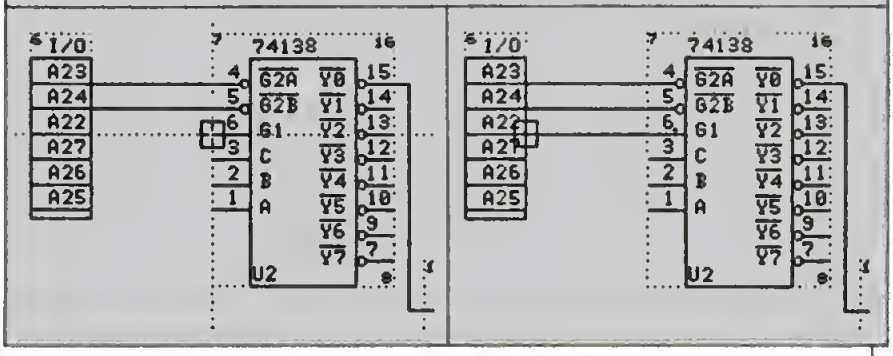
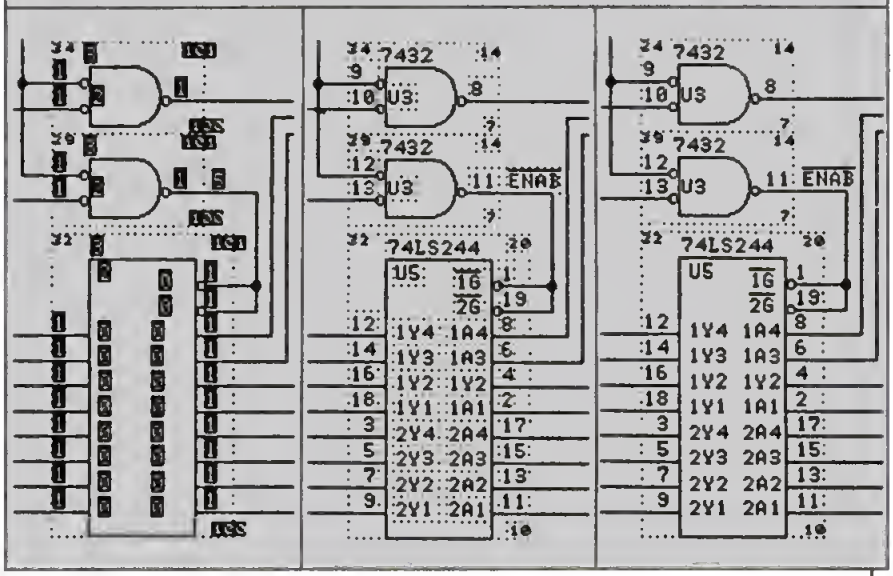


Figure 9: A portion of the schematic diagram as it appears in Alpha Attribute display, Alpha Boundary display, and Normal display.



LARGER CADD systems use the DASH-1 information to "auto-place" and "auto-route" printed circuit boards.

Area Editing Commands

What happens when you suddenly remember that you forgot a compnnent that must be added in a section of the schematic where there isn't any room? You can use the Area Editing commands, which begin with the left bracket symbol ([), to solve this problem. Just target ([T) an area of the schematic to move ([M) over to make room for the other part. You can even copy ([C) sections of a schematic all at once.

To target an area for moving or saving, place the graphics cursor in one corner of the area you want and enter "[T"; then place the cursor in the opposite corner and press the Return key. A dashed block will appear around the area targeted to show you what has been selected. As you might guess from the other K commands, [B cancels the target of the area previously selected.

After an area move, there usually are some line segments that need to be reconnected because the move only affected items completely inside the targeted area. If you want to use the moved section again (a general purpose power supply circuit, for example) on other schematics, you can [SAVE that area on disk for later [LOADing. It only takes about 2 seconds to load an area. [ERASE removes an entire section from the schematic at one time.

Symbol Definition Commands

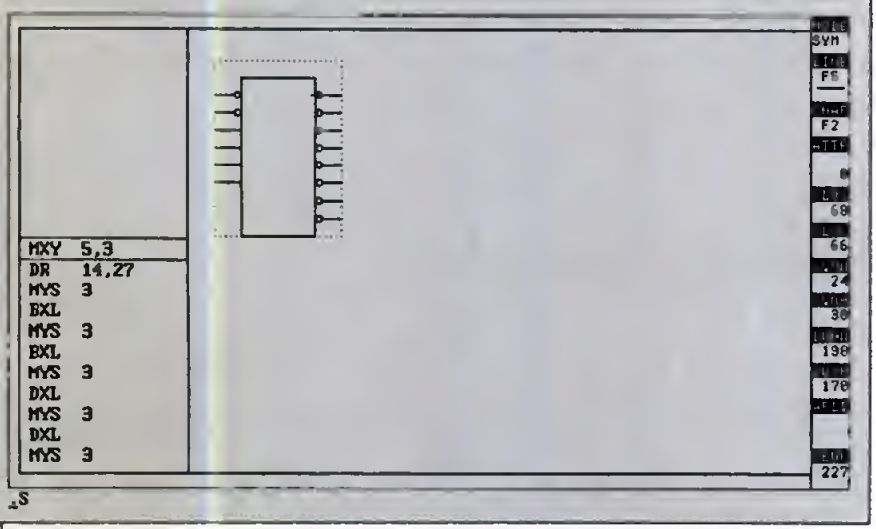
The Symbol Definition commands are more complicated than any of the other commands; there's also a large number of them. I will not run through all of them, but needless to say, there are sufficient commands to create any schematic symbol you need that is not included in the system's library.

When creating a new symbol or editing an old one, the screen format changes from the normal editing screen to the one shown in Figure 10. The MODE indicator on the right of the screen now displays SYM for symbol editing mode. The screen is split up into two main sections: The right side is the symbol display area, and the left side displays the commands entered to create the symbol. Figure 10 shows a simple IC symbol and part of the commands used to build it. There are some special symbol elements that can be used to create more complicated symbols: arrows, triangles, circles, dots, etc. *DASH-1* also provides many "graphics elements," such as gates and inductor coil, resistor, and capacitor symbols, that you can use to build other parts.

Transporting Pin Lists

For companies looking to speed up schematic entry, the pin list capability could be the most important aspect of the *DASH-1* and *DASH-1XT* systems. The pin list gives complete details of each connection, pin number, signals tied to each pin, component reference, component part number, component value, etc. All infor-

Figure 10: The editing screen for creating a new symbol using the Symbol Definition commands. The right side of the screen displays the symbol as it is built up; the left side displays the Symbol Definition commands as they are entered.



mation necessary for a larger CADD system is included in the pin list. The manual gives a clear enumeration of how each item is listed in the pin list and the length of each field, so manipulation of the *DASH-1*'s files by another computer's program will be easy. A *DASH-1* pin list is an ASCII file that most programs can work with easily. An excerpt from the pin list generated from my game control adapter schematic is shown in Figure 11.

To make matters better, FutureNet is writing software filters that will take the pin list and change it into the format required by several of the large CADD systems, including the Calma, ComputerVision, AppleCon, ReDac, and IBM's CBDS. When the information is processed by these filters, the only job left for the user is uploading the "filtered" files into the mainframe CADD systems. FutureNet is selling the VTERM package to do that task. The software filters are not yet ready, but according to Terry Zimmerman, it will not be too much longer until they are introduced.

Ease of Use

One of the nice features of the *DASH-1* system is that it is very easy to learn and use. I was creating schematics with relative ease in one day. The commands are very similar whether you are working with alpha text, line segments, component symbols, or areas; the 'C, /C, .C, and [C all mean to copy something. One command group is much like the others—only the prefix is different. Within each group there are some commands that are unique, but for the major commands, the similarity runs through all the editing command groups.

There is no on-line Help system included in the program, so all assistance must come from the manual. There is some terminology that you must master before you can understand the system very well; learning it will take a little reading time. The quick responses of the system in symbol and area manipulations, along with the ease of inserting line segments using the mouse, make this a very fast schematic editing program.

The User's Manual

I thought the manual was very good. There are three main sections in the manual. The first, called the User's Manual, includes an introduction to the manual, installation instructions, explanations of terms and drawing conventions, and five sessions of examples to step you through using the capabilities. I found the example sessions to be invaluable in learning the system, and they did not take very long to work through.

The second section has a detailed explanation of every command. Each command is treated on its own page. The last section contains appendices that explain the different attribute types, system information and error messages, listing of the commands, listing of symbol and graphics elements, the pin list format, and the system symbol library. The only addition I would recommend is a complete index containing all commands and terms. The manual comes in a regular 11-inch, three-ring notebook with each major section tabbed for easy reference.

I have to give high marks to FutureNet for its *DASH-1* and *DASH-1XT* systems. I was truly impressed! The authors obviously put many hours into developing this product, and the time paid off. I predict that FutureNet will have more business than it can handle when the word gets around that the capabilities of this system are available for such a low price. I also congratulate FutureNet for starting to use some of the untapped power of the PC. I hope that other companies join the trend of proving that the PC is indeed capable of far more than just running word processing and spreadsheet programs. */PC*

Figure 11: A portion of the pin list for the IBM Game Control Adapter schematic created with the DASH-1. This pin list can be uploaded to a larger CADD system.

```
DWG TITLS0   IBM PC Game Control Adapter
DWG DNUM51   SK-1001
DWG DREV52   A
DWG DPAGS3   1 OF 1
2    LOC 2   J2
2    PIN 1   1                +5
2    PIN 1   8                +5
2    PIN 1   9                +5
2    PIN 1   15               +5
6    LOC 2   1/0
6    PIN 1   A22              A9
6    PIN 1   A23              A8
6    PIN 1   A24              A7
6    PIN 1   A25              A6
6    PIN 1   A26              A5
6    PIN 1   A27              A4
7    LOC 2   U2
7    PART3   74138
7    PIN 1   1                A6
7    PIN 1   2                A5
7    PIN 1   3                A4
7    PIN 1   4                A5
7    PIN 1   5                A7
7    PIN 1   6                A9
7    PIN 1   7
7    PIN 1   8                GND
7    PIN 1   9
7    PIN 1   10
7    PIN 1   11
7    PIN 1   12
7    PIN 1   13
7    PIN 1   14
7    PIN 1   15               ***1
7    PIN 1   16               +5V
11   LOC 2   RN1
11   VAL 4   1K
11   PIN 1   9                ***2
11   PIN 1   10               ***3
11   PIN 1   11               ***4
11   PIN 1   12               ***5
11   PIN 1   16               +5
12   LOC 2   J2
12   PIN 1   4                GND
12   PIN 1   5                GND
12   PIN 1   12               GND
15   LOC 2   J2
15   PIN 1   2                ***5
15   PIN 1   7                ***4
15   PIN 1   10               ***3
15   PIN 1   14               ***2
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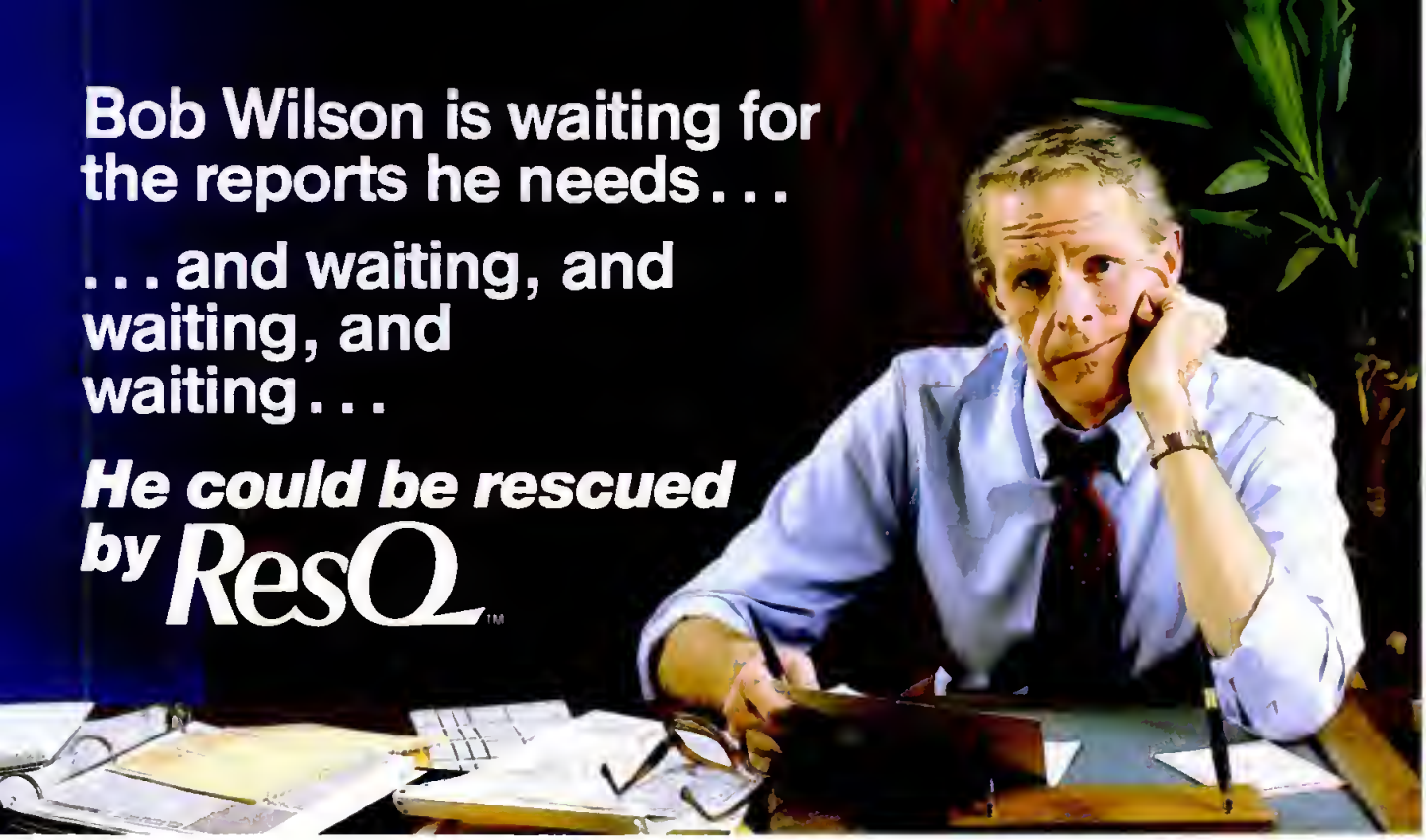

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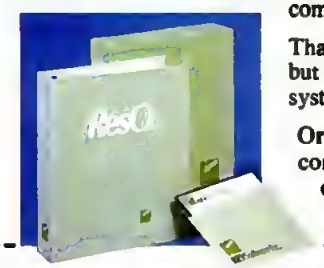

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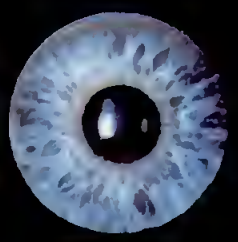

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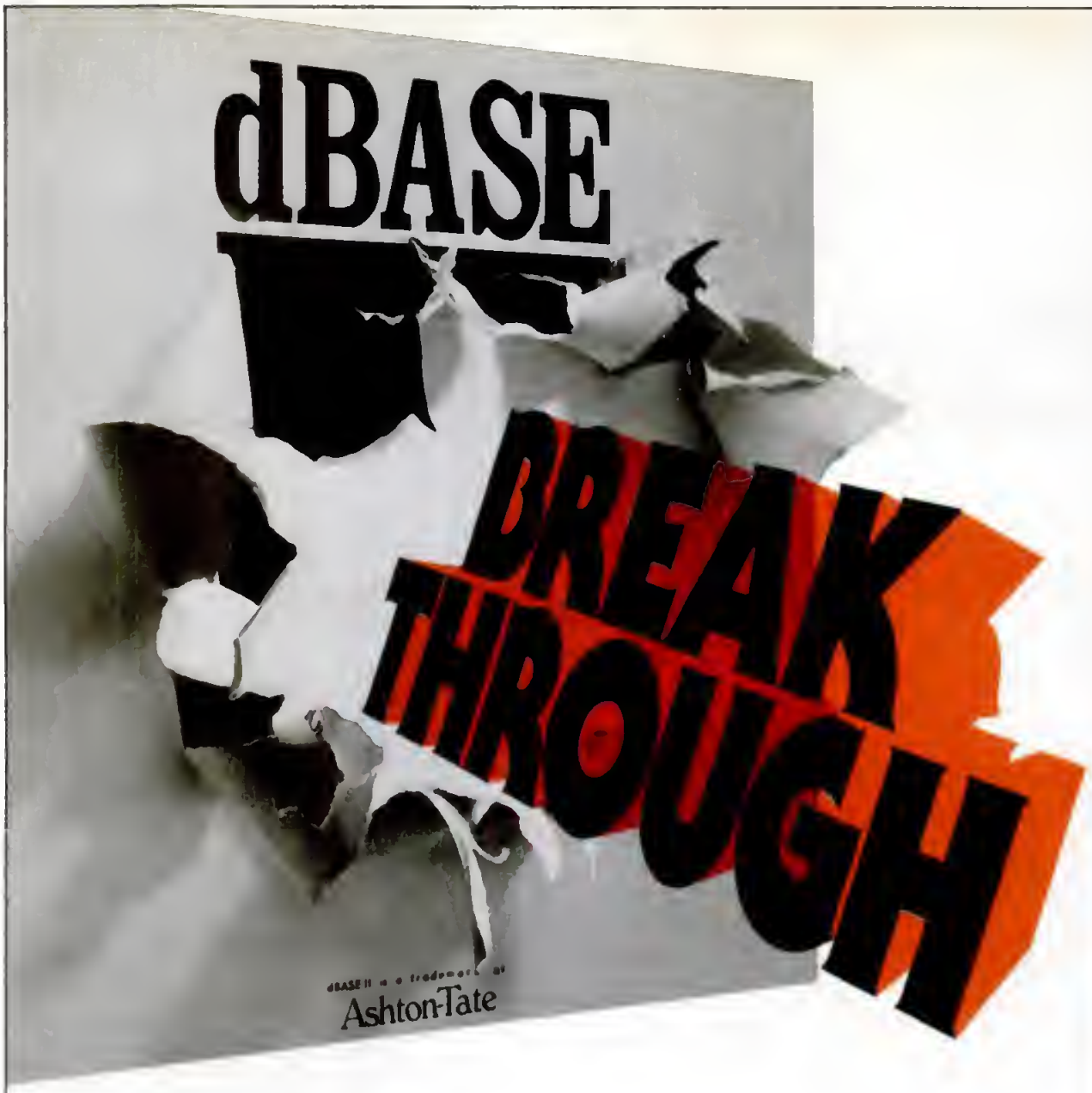

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HARDWARE/JOHN M. WORAM

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Info-SORT
Info-Pros, Inc.
2102 Business Center Dr., #132
Irvine, CA 92715
(714) 851-8975
List Price: $95
Requires: 64K with DOS 1.1, 96K with DOS 2.0, ona disk drive (two recommended).

CIRCLE 655 ON READER SERVICE CARD

PC-FILE
Jim Button
P.O. Box 5786
Bellevue, WA 98006
Compuserve, 71435, 2012; Source ID, CL2925
List Price: User Supportad Software—$35 contribution suggested
Requires: 64K with DOS 1.1, 96K with DOS 2.0, one disk drive (128K and two disk drives recommended).

CIRCLE 654 ON READER SERVICE CARD

Sooner or later, most of us will discover a need for e sort routine. Frequantly encountered are variations of tha famous "bubble sort," in which all the elements of an arrey are placed in the proper order (alphabetical, numarical, chronological, or whetever). Briefly stated, the bubble sort compares edjacent pairs of numbers (or strings) and "bubbles" the lower-velued item upwards in the list. Eventuelly, the list fizzas its way into numerical, or alphabeticel, order.

About the nicest thing to be said for tha bubble sort is that it can be conveniently used to help you devalop some progremming expertisa. Getting ell thosa bubbles properly lined up can be a greet learning process, although there mey be some early trauma during those moments when your progrem proudly announces that 13,385.34 is somawhat less than −7.

Figure 1 lists e very simple bubble-sort routina that arrenges the letters of the alphebet in the proper order. Note thet three sets of data are given, in which the letters are first read into memory in the order thay appear on the keyboard, than in elphabatical ordar, and finally in the worst order imeginable—completely backwards. In each casa, tha sort time is about 4 seconds. In the first sort, the letters a, b, and c wind up at the end of the list, since they eppear in the DATA stetements in lower case, and their ASCII veluas (97, 98, 99) are greater than thet for capital Z (90). A way around this inconvenience might be to force the initiel letter of any string into e capital latter before doing the sort.

Sort time gets quite e bit longer with something e little more useful. A list of 350 manufecturers' names tekes elmost 14 minutes to sort itself, and it would take much longar if tha sort had to swap eddresses and phone numbers as well.

Rather than swep every field in a record during a sort, an indax pointar, P(n), can be assigned to tha key field—thet is, the one on which the sort is to be made. Then, whanaver the kay fiald gets swepped, its index pointar can come along with it in the swep. For exemple, say the Zete Corporation is the third entry, MFR$(3), in your unsorted list, but winds up in position 482 after the sort routine does its work. After sorting, MFR$(482) = "Zeta Corporation," whlle P(482) = 3. Needless to say, ell the other informetion ebout the folks at Zete is still back at position 3. For instant eccess, just PRINT MFR$(482), OTHERSTUFF$(P(482)).

WHENEVER the key field gets swapped, its index pointer can come along with it in the swap.

A Shell-Metzner sort will speed things

up considerably by making more comparisons but far fewer actual switches. After all, in just about any random list, a good proportion of comparisons—perhaps half of them—will require no switching, since the elements are already in the proper order. Figure 2 is a typical example of a Shell-Metzner sort; with this one, it takes just under 2 minutes to sort the same list of manufacturers, along with their index pointers. In compiled BASIC, it takes only 15 seconds. Though that's much better, it still may not be good enough when the files get bigger and the sorting needs to be done for results, rather than for learning how to program.

As an aside, I encountered an interesting characteristic (polite way of saying "bug") when running the compiled version of the Shell-Metzner sort. When a sequential file is written using PRINT#, the field is enclosed in quotes, which allows commas to appear within it. No problem so far. However, if one of the fields winds up with only one character in it, then the next field gets pushed out of sequence. For example, in Figure 2 the 140-180 loop reads the records into memory. On the Nth loop, if C$(N) = "7", then D$(N) becomes A$(N + 1), and the real A$(N + 1) appears as B$(N + 1), and so on. Needless to say, this completely demolishes the sort routine—but only on the compiled program; the regular BASIC program runs just fine. I got around this one by adding a blank space to any single-character fields, and went on to worry about other things instead.

Of course, if you'd rather let someone else do the worrying for you, there are all sorts of fancy database management software packages available, with fancy database prices to match the sophisticated programming.

Figure 1: A simple bubble-sort routine.

```
100 CLS
110 DIM D$(26)
120 FOR SORT = 1 TO 3
130 FOR X = 1 TO 26
140    READ D$(X)
150    PRINT D$ (X);
160 NEXT
170 PRINT TAB (30) "Unsorted Data #"; SORT
180 REM Bubble-sort routine
190 TIME$ = "0:00:00.0"
200 FOR X = 1 TO 25
210    Y = X + 1
220    IF D$(X) > D$(Y) THEN SWAP D$(X), D$ (Y)
230    Y = Y + 1
240 IF Y < 27 THEN 220
250 NEXT
260 PRINT TAB (18) "Sort Time: ";TIME$:" seconds"
270 REM Print sorted list
280 FOR X = 1 TO 26
290    PRINT D$(X);
300 NEXT
310 PRINT TAB (30)" Sorted Data"
320 PRINT:PRINT
330 NEXT SORT
340 END
350 REM Note small a, c, b in the data
360 DATA Q, W, E, R, T, Y, U, I, O, P
370 DATA a, S, D, F, G, H, J, K, L
380 DATA Z, X, c, V, b, N, M
390 REM Next data are already sorted
400 DATA A, B, C, D, E, F, G, H, I
410 DATA J, K, L, M, N, O, P, Q, R
420 DATA S, T, U, V, W, X, Y, Z
430 REM ,Final data are in reverse order
440 DATA Z, Y, X, W, V, U, T, S, R
450 DATA Q, P, O, N, M, L, K, J, I
460 DATA H, G, F, E, D, C, B, A
```

What about a nice, simple sort that can be used with a minimum of pain and that doesn't have a price tag beyond the threshold of pain?

Take that list of 350 manufacturers, for example. Actually, it's a list of 367 equipment reviews that have appeared in a magazine that I edit. Since the magazine is still in business, the list grows by a few reviews every month. And people frequently call up to ask when we reviewed some "whatchamacallit" that "whosit" made (or was it "whatsit"?) Or, "Please send me a list of tape recorder reviews that have appeared since June, 1979." And then there's "What have you done on Brand X lately?"

IF YOU'D rather let someone else do the worrying for you, there are all sorts of fancy database management software packages available.

What's needed is a sort routine that will take care of all this with a minimum of effort. The list must be updated and resorted every month, and doing this should not turn into a major production. While we're at it, the sort should be able to handle other tasks as well—for example, a phone list, an electronic index file, or whatever else comes up around the office.

Several sort programs were recommended for the job. The Westbury, Long Island Computerland suggested that I check out *Info-SORT*. Michael Tapes at Sound Workshop (see *PC Magazine*, Volume 2 Number 3) mentioned Ensign Software's *FAST SORT*. Another friend promised to run off a copy of *PC-FILE* for me.

While waiting for all this software to show up, I began making up a sequential file containing the records I wanted to sort. The local experts said I should prepare a fixed-length random-access file, since this is what the software will want to see.

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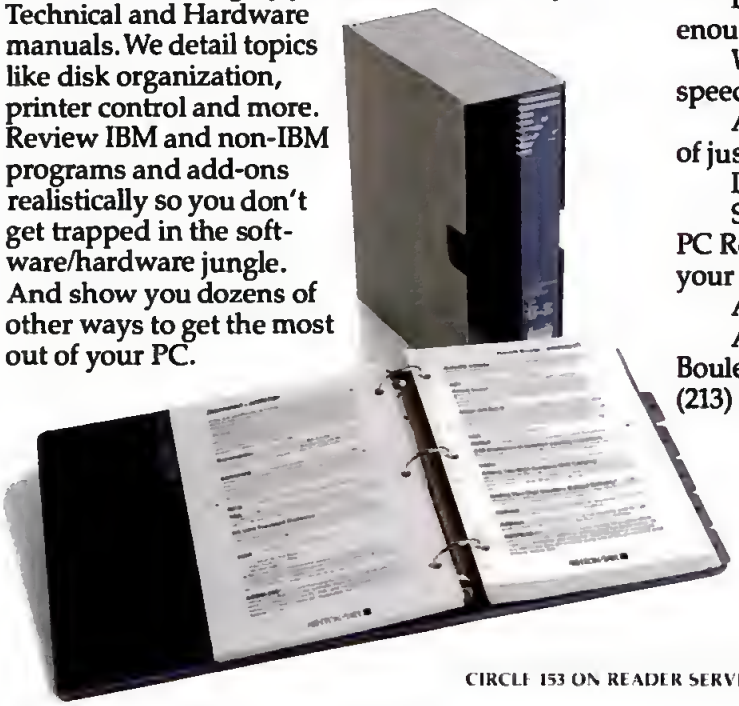

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Figure 2: *The Shell-Metzner sort speeds things up considerably by making more (4) comporisons but fewer actual swops.*

```
100 CLS
110 DIM A$(350), B$(350), C$(350), D$(350)
120 DIM P(350)
130 OPEN "FILENAME" FOR INPUT AS #1
140 FOR X = 1 TO 350
150   INPUT #1, A$(X), B$(X), C$(X), D$(X)
160 P(X) = X
170 NEXT X
180 CLOSE #1
190 GOSUB 270
200 FOR X = 1 TO 350
210 PRINT A$(P(X)), B$(X);
220 PRINT TAB(40) C$(P(X));
230 PRINT TAB(60) D$(P(X))
240 NEXT X
250 PRINT T$' T$ = eort time
260 END
270 TIME$ = "0:00:00.0"
280 'Begin Shell Sort
290    M = 350' M = items to be eorted
300    M = M\2
310 IF M = 0 THEN 470
320    K = 350 - M
330    J = 1
340    I = J
350    L = I + M
360    C = C + 1' C = # of comparisons
370 IF  B$(I) <= B$(L) THEN 440
380 SWAP B$(I), B$(L)
390 SWAP P(I), P(L)
400    S = S + 1' S = # of swaps
410    I = I - M
420 IF I < 1 THEN 440
430 GOTO 350
440    J = J + 1
450 IF J > K THEN 300
460 GOTO 340
470 T$ = TIME$
480 'End Shell Sort
490 RETURN
```

Who cares what the software wents? I want to use my disk file spece efficiently; the software hed just better learn to cope. Who's in charge here enywey, me or it?

FAST SORT

Ensign Software's FAST SORT arrived first, along with e little eight-pege instruction manual. There didn't seem to be much here—in fact, the sort routine tekes up only 512 bytes of memory. Not very promising. Oh well, let's see what heppens.

The bed news first. In order to use FAST SORT, you must write your own support program. You'll have to figure out how to prepare your own file, and then write it to disk. Then you'll need e reedfile program to bring it beck into memory for sorting. But first, begin your progrem with four lines of code which will BLOAD Ensign's assembly-languege sort sub-routine into the top of memory. (Yes, the lines are specified in the instructions.)

After the part where your file gets read into memory, edd the line CALL FASTSORT%(OPT%, N%, A$(n), IP%(n), AD%), and then finish off with whatever you need to display and/or print the sorted file.

The parameters listed in the CALL FASTSORT line ere defined es follows:

- OPT% specifies the type of dete to be sorted (OPT% = 1 for a fixed-length string, 2 for e varieble-length string, 3 for an integer, etc.);
- N% is the number of items to be sorted;
- A$(n) is the name of the arrey to be sorted, beginning with n = 1 or 0, depending on which subscript you use for the first item in your array;
- IP%(n) is the index pointer, as discussed eerlier;
- AD% = 0 for an ascending-order sort and AD% <> 0 for e descending-order sort.

Code should be written to define all these parameters before the CALL FASTSORT% line. And you mey want to write several versions of CALL FASTSORT%, replecing thet A$(n) perameter with whetever other fields might need sorting. For instance, essume there are four fields lebeled A$, B$, C$, D$, in eech record. (How's thet for originality?)

The following lines will let you sort on whichever one of these you like:

```
100 INPUT S' (should be 1-4)
110 ON S GOTO 200, 210, 220, 230
200 CALL FASTSORT%(OPT%, N%,
      A$(N), IP%(N), AD%): GOTO
      300
210 CALL FASTSORT%(OPT%, N%,
      B$(N), IP%(N), AD%): GOTO 300
220 CALL FASTSORT%(OPT%, N%,
      C$(N), IP%(N), AD%): GOTO 300
230 CALL FASTSORT%(OPT%, N%,
      D$(N), IP%(N), AD%): GOTO
      300
300 'begin display of sorted file, for
      example;
310 PRINT A$(N), B$(IP%(N)), '(etc.)
```

This will work out nicely for my file (I hope). I've got four fields in eech record (A$ = category, B$ = manufecturer, C$ = model number, D$ = dete). To save file spece, eech category was assigned e number, which certeinly beats writing out, sey, "tepe recorder, two-track" over and over agein. A dete of 790328 means the review eppeared in (19)79, in the March (03) issue, on pege 28. Note that categories and detes are both entered es strings to save more spece.

With ell of this done, I chose S = 2, (to sort by manufecturer) and timidly depressed F2. *Voilo!*—nothing heppened. In the time it took to glance beck up et the screen, my file of 367 reviews hed begun scrolling its wey ecross the tube.

Wait e minute! Thet's not my file. My file wes in chronological order (thet's the wey it wes entered). This one's in ... elphebetical order by manufecturer! Now that wes fast. I tried it again with my eyes on the screen this time. It eppeared to take about one second. I was impressed.

It turns out there are multiple entries in my file for some manufecturers. For example, over the years we've reviewed more

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than a dozen Tascam products. Well, they show up sequentially all right, but due to the nature of the Shell sort, the original chronological order has become somewhat random. It would be nice if the list sorted first by manufacturer, and then by date if more than one listing is found.

Nothing to it. Before calling FASTSORT%, just let B$ = B$ + D$. This appends the date field (D$) to the end of the manufacturer field (B$). This forces the subroutine to sort by manufacturer and date at the same time. Of course, that date string tacked on to the manufacturer's name looks a little inappropriate, but a PRINT LEFT$(B$, LEN(B$) − 6) will get rid of it nicely. (The subscripts have been left off just to keep these examples from getting any harder to follow. In other words, B$ should really be B$(N), and so forth.)

Going a step further, the category field (A$) can be changed to A$ = A$ + "/" + D$ before calling the sort subroutine, so categories may also be sub-sorted by date. That "/" is just a quick way to extract the category string after sorting, as in the following: F(n) = VAL(A$). Now, we can go read some data to discover that CAT$(F(n)) = "tape recorder, two-track."

The date string can be brokeo up into something more readable by saying: PRiNT "19";LEFT$(D$,2);", "MID$(D$,3,2);", page ";RIGHT$(D$,2), which looks like 1979, 03, page 28. For those who don't know when to quit, that 03 could be replaced by "March," or if you like, "March, 1979," etc.

For further enhancement, the print routine could be modified to display only certain sorted fields. For example, if you wanted a readout of only the Yamaha reviews, you couid add something like IF LEFT$(B$,LEN(SCH$)) <> SCH$ THEN GOTO N. Here, N is whatever line number is just beyond the print instructions, and SCH$ = "Yam," or whatever it takes to differentiate Yamaha from all the other entries beginning with Y.

To return to the point, Ensign's FAST SORT is a lightning-fast subroutine that will delight anyone who wants to tailor a sort program to a specific need. included in the package is a linkabie object file for use with a compiler. However, if you'd rather not go to the effort of preparing the necessary support program, you may want to look at a sort program that is complete in itseif.

Info-SORT

Developed by info-Pros, Inc., *Info-SORT* will sort fixed-length records, on as many as nine key fields, in ascending or descending order. As with FAST SORT, there is no provision made for writing the file—again, it's up to you to do this on your own.

Since my file was already written sequentially, it wouldn't work, because

INFO-SORT needs to know just how much space is occupied by each field.

Info-SORT needs to know just how much space is occupied by each field, as weil as the starting locations of all fields within the record. Putting aside my objections to preparing software to please the computer, I ran the littie program in Figure 3, which quickiy converted my sequential file into the required fixed-length format. The new file takes up 15,104 bytes, compared to the 12,544 bytes for the sequential file.

With that chore out of the way, the first step is to write a control file, in which you teil Info-SORT just what it is you want to do. From DOS, just enter PSORT, and a series of niceiy organized menus lead the way through the procedure. Info-SORT will read your existing program, sort it according to your instructions, and write the sorted program to disk. Therefore, you must specify an input filename, the drive on which it is to be found, the length of each record, an output filename, the drive on which this should be written, and the type of output file you want (Address, Record, or Index). The Record output file creates an output file with all the information contained within the input file. In other words, its the one you'll probably

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CIRCLE 370 ON READER SERVICE CARD

use most of the time. (Attention first-time users: There's a typo in the file statement screen listing on pages 3-10 in the manual. It shows Output file type "I," but this should be "R," as noted on pages 3-9.)

Later in the process of creating the control file, a sort field-statement menu is used to specify the parameters for each sort that you want up to the maximum of nine fields. You must enter the starting position for each field that is to be sorted, the type of data in the field (character, integer, etc.), the field length, and the sort order (ascending or descending).

When you're finally done with all this, function key F1 saves your control file and returns you to DOS. Now type SORT CONTROL, and in about 10 seconds your input file will be sorted and written to disk with the name you specified for output file. Note that you sort the input file by typing SORT CONTROL (or whatever it is you called your control file). If you type SORT (input filename), you'll get a "bad data in file statement" message. (By the way, the control file described here occupies 512 bytes, and the sorted output file chewed up 15,047 bytes.)

On the off chance you may want to actually look at your sorted file, you're on your own again. But it may not be a problem. Chances are by now you've already written a file-read program to look at your original unsorted file, and you can simply go back and change the OPEN "(filename)" line to open the new output file.

For users who don't want to do any programming work at all, Freeware's *PC-FILE* takes care of the whole works. Records may be added, changed, deleted, displayed (to screen or printer), found, listed, and sorted, using the function keys to select the desired option.

From DOS, type *PC-FILE*, and in a few seconds you'll be asked, "Which drive (A-H) for the Data:." Enter the appropriate letter, and you'll be told, "These files are already defined:", and at the bottom of the screen: "What File:_____." If you haven't defined any files yet, there won't be anything else on the screen. If a file has already been defined, its name will be displayed. In other words, to begin a new file, answer "What File:_____" with a new name; to work on an old file, enter one of the names that already appears on-screen.

Even if you've already got a fixed-

Figure 3: This program will read a sequential file and write it to disk as a fixed-length file.

```
100 CLS
110 DIM A$(400), B$(400), C$(400), D$(400)
120 PRINT "Please wait. The list is being entered into memory."
130 OPEN "SEQFILE" FOR INPUT AS #1
140 N = N + 1
150 IF EOF(1) THEN CLOSE #1:N = N - 1: GOTO 180
160 INPUT #1, A$(N), B$(N), C$(N), D$(N)
170 GOTO 140
180 CLS
190 PRINT "There are";N;" entries."
200 CLOSE #1
210 OPEN "RANFILE" AS #1 LEN = 41
220 FIELD #1, 2 AS A$, 18 AS B$, 15 AS C$, 6 AS D$
230 FOR X = 1 TO N
240 LSET A$ = A$(X)
250 LSET B$ = B$(X)
260 LSET C$ = C$(X)
270 LSET D$ = D$(X)
280 PUT #1, X
290 NEXT X
300 CLOSE #1
310 OPEN "RANFILE" AS #1
320 FOR X = 1 TO N
330 GET #1, X
340 PRINT A$(X), B$(X), C$(X), D$(X)
350 NEXT
360 CLOSE #1
370 END
```


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DEALER INQUIRIES WELCOME

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length, rendom-access file oo hand, it may need a lIttle work to get it in shepe for *PC-FILE*. Figure 4 is a variation on the program seen in Figure 3, and wes used to convert my original sequential file for sorting by *PC-FILE*. Note the addition of a carriege return, E$ = CHR$(13), to the end of each record (llne 275), and the "\" entered as the final record (line 205). Also, the file must be saved with the suffix DTA, as seen in line 310. Of course, if you're starting a new *PC-FILE* from scratch, you don't heve to bother with this. Just use the "add a record option" (F1), end the carriage returns and backslash are taken care of by the program, as is that DTA suffix.

IF YOU MUST choose only one, perhaps your preference between sequential and random-access files should be the deciding factor.

To define a file, you enter names and lengths for the fields that will be contaioed within each record. Don't insert commas in the field names. For example, entering CITY, STATE followed by a length of 20 would be interpreted as a field named CITY with e length of zero, and a STATE field with a length of 20.

Once you're through defining the fields, you're returned to the mester menu, which looks like this;

(F1) ADD a record
(F2) MODify e record
(F3) DELete a record
(F4) DISplay a record
(F5) FINd e record
(F6) LISt e record
(F7) SORt the index
(F8) EXPort or other utilities
(F9) alter a field NAMe
(F10) END or change database
KEY set up the smart KEYS
Your Command:___

The first order of business is to sort your random file in whetever order you prefer. Uolike *Info-SORT*, *PC-FILE* does not write a completely sorted file to disk. Instead, it writes an index pointer file, called (filename).INX. For eech record, the file conteins the first two characters in each field, followed by the record number itself, as seen in Figure 5.

The process tekes forever. Some 10 seconds after pressing function key F7, you are asked to specify the neme and length of the sort field, or fields. When thet's done, an "extracting sort keys" message is seen for another 10 seconds, followed by "Building Index" end eventuelly, "Transferring to *PC-FILE*." All this takes about 2 minutes end 25 seconds for my 367-record file.

However, once the index file has been built, *PC-FILE* leaves the competition ln the dust. You can displey eny record instently, or e collection of records thet satisfy up to ten selection criteria. For example, the menuel shows how to find all femele employees between the ages of 20 end 40 who ere single. (Further statistics on this group are no doubt beyond the scope of most computers.)

Speaking of the manual, it's a document file on the disk and mey be printed from DOS by typing DOC.BAT. Just meke sure to have lots of paper ready—lt's 25 pages long and full of velueble information. For exemple, the "smert key" option allows you to progrem the number keys to perform multiple-entry instructions with a single Alt keystroke. Begin by typlng KEY while viewing the master menu. Then press eny number key, followed by your instructions. In programming e smart key, a "/" is entered wherever a carriage return is required. *PC-FILE* author Jim Button uses SOR/NAME/5//A/LIS/USERS/P/A/R, which he says means somethiog like the followiog: sort on the name field, length 5, no other sort fields, sort in ascending order, list in the user's format to the printer, including all records, using the report formet. Or, es Button puts it, "Whew!"

Whew, indeed. There are also instructions on using *PC-FILE* with Visi- and other -Calcs, with MoilMerge-type programs, end instructions on how to "import" files created under other systems. Or, you can "export" your *PC-FILE*s into WordStor. Demaged databases mey be fixed with FILEFIX.EXE. And then there's SAMPLE.BAS, which prints out additionel (!) information for programmers who want to know more about how to code their own programs into *PC-FILE*.

Figure 4: A voriotion in the program given in Figure 3 to prepare a file for processing by PC-FILE.

```
100 CLS
110 DIM A$(400), B$(400), C$(400), D$(400)
120 PRINT "Pleaae wait. The list is being entered into memory."
130 OPEN "SEQFILE" FOR INPUT AS #1
140 N = N + 1
150 IF EOF(1) THEN CLOSE #1: GOTO 210
160 INPUT #1, A$(N), B$(N), C$(N), D$(N)
170 GOTO 140
180 CLS
190 PRINT "There are";N;" entriea."
200 CLOSE #1
205 A$(N) = "\"
210 OPEN "RANDOM.DTA" AS #1 LEN = 42
220 FIELD #1, 2 AS A$, 18 AS B$, 15 AS C$, 6 AS D$, 1 AS E$
230 FOR X = 1 TO N
240 LSET A$ = A$(X)
250 LSET B$ = B$(X)
260 LSET C$ = C$(X)
270 LSET D$ = D$(X)
275 LSET E$ = CHR$(13)
280 PUT #1, X
290 NEXT X
300 CLOSE #1
310 OPEN "RANDOM.DTA" AS #1
320 FOR X = 1 TO N
330 GET #1, X
340 PRINT A$(X), B$(X), C$(X), D$(X)
350 NEXT
360 CLOSE #1
370 END
```

Sorting It All Out

For this reviewer, et least, Info-SORT

needs a more internal support to make it a serious contender as a stand-alone sort program. As far as it goes, the present package is wall thought-out, and tha menus are not at all difficult to follow, even for the beginner. However, there is no provision for writing files, nor for reading them once they are sorted. Also missing ere the meens for modifying files, finding salected racords, or doing any other file-manipulation chores.

Figure 5: A look ot the partial contents of o typicol index file (.INX), os created by PC-FILE. The first eight choracters in the first line comprise the first two characters of eoch of the four fields in the record. This is followed by the record number, 0318. The process repeats for each record in the file.

```
35AbST820318 53AcFa780082
62Ad30790132 23Ae73790166
53Af12800222 91Ag...etc.
(spaces inserted for clarity)
```

As for choosing between Ensign's *FAST SORT* and Jim Button's *PC-FILE*, why bother? For about 60 bucks, you can heve them both! However, if you must choose only one, perhaps your preference between sequential and random-access files should be the deciding factor.

Sequantiel files are space-efficient, but it's not that easy to modify e record within tha file. On the other hand, if it's an index file, it probably won't need editing anyway, other than error corrections, and thasa can usually be handled through a word processor. The slower access speed of the saquantial fila may be academic—my compiled program written eround *FAST SORT* takes about 1.5 seconds to find tha last antry in my index. For all prectical purposes, most records are found instantaneously.

Perhaps best of all, the sorted file naed never be written to disk, and this may be en important consideration. If tha file is to be regularly updetad and is usad mostly to answer on-the-spot inquiries that don't naed to be preserved, there's not much point in tying up disk space.

A final argument in favor of *FAST SORT:* By writing your own support progrem, it's comperatively eesy to write fields in a "coded" format (for example, "32" = digital revarberation systam), and then decode this back into something a little more readable for displey/printout. I guess I'm just hung up on saving spaca on disk.

But now, back to *PC-FILE*. Your file format may not require it, but you should be forewarnad that *PC-FILE* does not offer e coded-format capability. A six-digit employee number can't be squeazed into anything less, nor cen you do anything about ZIP codes, blood type, I.Q., etc.

What if your file records contein dete that naed frequent revision? Companies are continually moving, going out of business, changing phone numbers, hiring and firing, etc. If you're trying to manage a file that will keep track of all this, *PC-FILE* is certainly tha way to fly—and it's a first-class trip at that. */PC*

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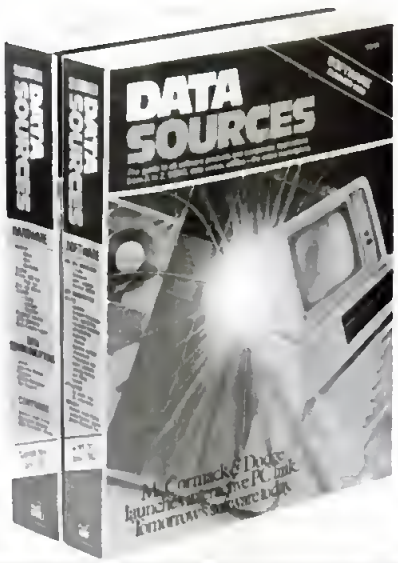

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After being warned that the process would generate some frustrations, a programming neophyte accepts the challenge of writing his own solo program in BASIC.

I Was A Programming Virgin

Ma and my big mouth.

It all began with an innocuous comment during e conversation with *PC Magozine* executive editor, Corey Sandlar. "By the way," I told Corey, "I'm thinking of taking an introductory course in BASIC but heven't found one around here given on the PC." As an elternativa, ha suggested a few books and I said, "Fine." And it was fine until the next dey when Corey called back. He'd come across e couple of 1-day BASIC-for-beginners courses end wanted to know if I'd like to take one, then try writing my own program. I could then write about my maiden venture into programming for *PC*.

Me? Try programming? Ma? Write my own? Wbat about all those software disks, books, and magazines just chock full of progrems for any purposa end any occasion? Ma? A guy who meneged to get through 4 years of collega and 3 years of graduate study without a single meth, stetistics, or computer science course; wbo came no closer to the hard sciancas than a freshmen geology class? Me?

"An eesy one," Corey reassured me. Meyba e program for balancing my checkbook or celculeting tha odds et horse racas. I don't go to the track or ante up at the local off-track betting parlor, so designing e way to handicap the ponies didn't appeal to me. On the other hand, I have trouble balancing my checkbook with e calculator (and bow did I evar manege before tha proliferetion of calulators?), so writing that kind of progrem seemed at least potentially useful. In fairness to Coray, I'll acknowladge his obsarvation thet the process would ganerate some frustrations. He wasn't kidding, es I was soon to laarn.

I took e deep breeth and agreed to the project, although flashing through my mind was tha painful memory of a college gym class where the swimming coach dered me to dive off tha high board. "You wouldn't want to try it, would you?" the coach hed esked sneeringly after my bellyflop from tha low board. Of course, I couldn't ignore that kind of chellenge. With trepidation, I mounted the ledder to tha high board to try the technique he promised would guerantee me e perfect diva. I bally-floppad.

In my defense, I must say I'm not a computer virgin. As e nawspapar reportar I have years of familiarity with word processors. Also, I'd used my own PC for months, primarily for word processing, but also to pley gemes. In eddition, I knew anough about BASIC from the *PC Guide to Operations* to load and run the "Samples" program, to pley all tha songs, win the donkey gama unless I got careless, and print a calandar for any yaar betwean 1981 and 1989.

In other words, I confess to being e programming virgin. But Corey was offering an opportunity and an incentive to losa that intellectual virginity. Basides, it was a question of honor. After all, one reeson I bought the IBM PC was its ease of programming, or so I told my many friands who asked why I hadn't salectad one of

Photograph: Dean Janoff

tha lass costly microcomputer systems.

Making the First Move

As my first move in this endaavor of quastionable sanity, I erranged to teka a dey-long "Fundamentals of tha BASIC Languaga for Beginnars" coursa sponsored by tha Boston Computar Sociaty. Aftar tha 5 hours of hands-on training, I'd be ebla to write my own program at the comfort of my own keyboard, a mambar of tha society told ma.

As my first move in this endeavor of questionable sanity, I arranged to take a day-long course sponsored by the Boston Computer Society.

In tha meantime, I gazed wistfully at three introductory-leval books on BASIC programming for the PC. I glancad et their tablas of contents but rejected the impulse to read any of the books, particularly the one that included several dozen programs, all of which were bilied as "useful" by the author and publisher. It wouldn't be fair, I told mysalf. Aftar all, I was committed to ventura into programming without such a crutch.

But it wouldn't be cheating to look through Microsoft's BASIC manual. Using it for my mission was within the ground rulas, I rationalized. Carefully I withdrew tha manuel from the slipcase in which it had nastled undisturbed since I had opened and shut it while unpacking my PC. Yas, its covar was still e dull olive green. Yes, right at the beginning it still warned: "In order to use this manual you should have some knowledga of ganeral programming concepts; we are not trying to teach you how to program in this menual." Yes, it still was fillad with such alien tarms as "ERR and ERL Variablas," "ON COM (n) Statement," and POS Function." Yes, it was still incomprehensible, so I put it neatly back in its slipcesa to await the completion of my coursa.

I mada tha trip to Boston on e 15-seat twin-enginad plena that yo-yoed emong tha clouds. Fortunately, no food wes servad on the flight, end even the pilot didn't eat whataver supper ha'd brought aboard in a smell cooler. Tha naxt morning, I bravad heavy rains to gat to the Boston Centar for Computer Applications, which was gracious enough to land a room and a half-dozen PCs to tha PC user group for tha day.

Our instructor was a college student, a computer major who got things off to a good start by observing, "Learning languagas can be neadlessly confining." Ha went on to spand much of his tima in rembling irrelevancies about FORTRAN, how to hire college studants to do programming for you, end other topics that I fearad would be of little halp whan I teckled my first programming project. Those fears latar would be provan justified. As the hours dragged by, tha class size dwindled from about ten down to three die-hards, myself included. Ona of those who didn't return after lunch was tha ona who had told me ovar tha phona that tha class would prapare me for writing my first solo program. A bad omen, I thought.

By tha end of the 5 hours, I knew how to use parts of the BASIC manuel. Also on the positiva sida, I became familiar with such statamants as PRINT, REM, GOTO, IF THEN and INPUT.

At tha sama time, though, I pickad up some lass-than-ancouraging advica from the instructor. For axample, in referring to the phrese "syntax error," ha told us, "You'll gat an awful lot of it. It means you did something wrong." And there was the morala-undermining commant, "You've got to earn the ability to program. It's not a gift." Just in case any of us hald naive misconceptions to the contrary, tha instructor counselad us, "I've done it the hard way, end I've dona it tha easy way, and tha easy way is better."

With those thoughts in mind, I thumbed through the BASIC manual egain and wondared if I should have been so quick in refusing to look at the introductory books piled behind my printer at homa.

On My Own

With that classroom experience behind me end with the instructor's remarks echoing in my mind, it was time for the big step. Using a pan and paper, I jotted down e few ideas on what kind of things I wantad my program to do, including an audio alart for thosa inavitable times whan my checkbook belanca is in tha red.

Unebla to procrastinata any longar, I booted up with my DOS 1.1 diskatta, raceived tha A> prompt and smoothly typed in BASICA. Tha naxt stap was a piece of cake. 10 PRINT: PRINT: PRINT: I typed. Onward to SAVE"chakbal.bas, I typed next, proud of my ability to come up with a claver and memorable fila name.

I loadad my naw fila and ordared it to LIST. It did. 10 PRINT: PRINT: PRINT: This was aasiar than I'd axpectad.

```
20 PRINT "Freadman's Easy Chackbook Balancer"
30 PRINT "By Eric Freedman"
40 PRINT: PRINT: PRINT:
```

I added, ramembering that a faw lines of whita spaca makes the printout easier to read and more professional-looking. I passed the next test: RUN, I ordered, and, sure enough, there on my screen was:

```
Freedmen's Easy Checkbook Balancer
By Eric Freedman
```

I tried it a second time to make sure, playad around a bit with tha KEY off and KEY on commands as e momentary distrection, listed what I'd dona so far, and continuad with my maiden program.

It must have been a whopper of a syntax error in line 100; otherwise, my PC wouldn't have told me the same thing two more times.

```
50 PRINT "With this program, you'll be able to keep your checkbook balanced (hopefully, if things work right)."
60 PRINT "Freedman's Easy Chackbook Balancar will guida you step by stap."
70 PRINT "It will elso alart you with a beep if your balance dips precariously below $0."
80 PRINT: PRINT:
90 INPUT "Enter account number."
```

```
100 INPUT "Enter today's date."
110 INPUT "Enter previous balance."
```

So far, so good, I told myself smugly and gave the RUN command.

When the screen flashed "Syntax error in 90," I knew something was wrong. Recalling the instructor's confusing (to me, at least) discussion of strings, I typed in

```
90 A$ = 300 "ACCOUNT NUMBER"
100 INPUT A$
110 B$ = "Today's Date"
120 INPUT B$
130 PRE$ = "Your Previous Belence
    Was?"
140 INPUT PRE$
```

Then RUN. Then "Syntax error in 140." Then LIST. Then RUN. Then "Syntax error in 100." Then RUN. Then "Syntax error in 140." True, I hadn't edited line 140 after the first syntax error, but why should I? This was a smart and expensive machine, end it should be eble to figure things out for itself, right? Then LIST. Then LIST again. Then another syntax error in line 100. it must have been a whopper of a syntax error in line 100; otherwise, my PC wouldn't have told me the same thing two more times.

Awareness thet those introduction-to-BASIC books were close at hend ete eway at me. Lead us not into temptation, my conscience told me. They also serve who oniy sit and try to program, my conscience told me. Adam and Eve would have made a better world for themselves and their progeny if they hadn't succumbed to the enticement of forbidden knowledge, my conscience told me. When the going gets tough, the tough get going, my conscience continued. With a pretended air of self-confidence, I pushed the books to the other end of the table.

From time to time, I thumbed through the BASIC manuel, hoping to stumble across the magic clue to my problem. Wearily, i rubbed my eyes. With a deeply felt air of defeat, the I-told-myself-so part of my mind recalled one other thing my instructor had said: "If you work 2 hours and if you stare et it and get only ten lines, it's a bad program." Thanks, pal.

Help, Please

Back to the telephone. "Corey, it's not working," I dejectedly told my editor before launching into what in retrospect seemed to be a semi-incoherent recap of what i'd gone through so fer. i asked whether it would be okay to read one of the introductory books he had sent me.

Corey reminded me of his earlier observation ebout the unavoidability of frustrations, ordered me to keep the faith, and promised to send me IBM's BASIC Primer, a two-diskette tutorial by Marilyn Davis. (The $60 tutoriel is part of the IBM Personol Computer Educotion Series.)

I PROMISED myself, in the interest of integrity, to ignore screens 185-196, "Building a Checkbook Program."

i eagerly tore open the package when it arrived the next day. Two BASIC Primer diskettes and 21 pages of step-by-step documentation eppeared to be the answer to my prayers. Ah, there were the promises, right on the first page of the documentation: "Can be used by students of many ages," so I would no longer feel inferior to those elementary school kids who can knock off a program or two each day before first recess. "No previous computer knowledge required," so my minimal previous knowledge wouldn't lead me astray and might even prove to be e boon. "Lessons are easy to follow," (the easier the better).

Dutifully I followed the directions to prepare and duplicate my BASIC Primer diskettes. By the time the diskettes were loaded into my drives, I had successfully completed 18 of the 21 pages of documentation. It was a piece of cake so far. The remeining 3 pages were devoted to the lesson list, a directory of 237 screens' worth of "easy to follow" lessons, beginning with "Getting Started" and culmineting on screen 237 with "Programming without the BASIC Primer." I promised myself,

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CIRCLE 453 ON READER SERVICE CARD

in the interest of integrity, to ignore screens 185-196, "Building a Checkbook Program."

Things started smoothly enough. PRINT, SOUND, BEEP, CLS, LOCATE, RUN, and GOTO seemed relatively easy to master. Than I hit IF THEN and FOR NEXT, realizing that good things don't last forever. AUTO was simple enough, and INPUT mada sense, and I evan understood strings (or thought I did). The tutorial was full of examples, along with opportunities to design my own. "Seize the moment!," I told myself, and resolutely tried designing my own. Fortunately for me, the next screen always had the right answers to those opportunities. SWAP lost ma.

GUIDELINES or not, honor or not, it was time for a helping hand.

When it came to arrays, I could see the cursor physically leap from my Amdek 300G monitor to stab me between the eyes. There were a few moments of elation when I hit CHR$() and discovered how to get some weird symbols on my screen. When the going got really tough, I practiced my beep.

Try, Try Again

The tutorial moved fairly quickly, bringing me inescapably closer to the time when I'd have to try my checkbook balancing program again.

Remembering the concept of strings, INPUT "This Account Number IS? 4" became INPUT "Type in your account number", ACCT$. INPUT; "Your Previous Balance Was?" became INPUT "Previous Balance ",BAL$. Then I tried R$=BAL$-X$, which didn't work, probably because I had nothing defined for the strings R$ and X$. I did try my first *IF THEN:* IF R$ < 0 THEN BEEP. Still, I had no R$. Moving right along, nonetheless, line 130 became INPUT "Subtract next check or add next deposit, "Y$, although that gava me yet another undefined string Y$. I couldn't do a program without a GOTO, so I typed in instructions to GOTO lina 120 where it was to beep if the still-undafinad R$ was lass than 0.

Each syntax error or other harbinger of failure triggered more tinkering lina by line. Finally something almost worked. "What was your previous balance?" the screen asked. I typed in $766.98. "Subtract first check," the program prompted. I typed in $777. It did subtract, and lina after line of -10.02002 appeared on my screen as I frantically reached for my Ctrl and Scroll Lock keys.

More fiddling around, and sure enough, something partly worked, a big improvement over my recent almost worked. 100 INPUT "What was your previous balance? ", x 110 INPUT "Subtract first check ",Y

```
115 PRINT X-Y.
```

When I told it to run, it ran and it subtracted. Really.

It was too good to last. I typed in instructions for the computer to beep if the balance was les than 0, for it to subtract the next check unless there were no more checks, in which case it would go to INPUT "Add first deposit ",M. My loops must have been bad, because I couldn't get the program to subtract from the new balances, and sometimes it even added instead of subtracting. Starting with a previous balance of $200, the program properly subtractad my first $30.60 check, leaving a new balance of $169.40. Then I subtracted a $100.23 check and got a $69.17 balance. Then it began getting tricky. According to my PC, $69.17–$69=$100.40;$100.40–$0=$69.40; $69.40–69.50=$99.89999;$99.89999–$100=$69.40again;$69.40–$0=$169.40. At this point, I needed a break even if I didn't deserve one.

A Helping Hand

Guidelines or not, honor or not, it was tima for a helping hand, someona who could at least show me why something was wrong before my fist smashed into tha monitor. My wife, lucky for me, had taken a few computar courses in graduata school.

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CIRCLE 146 ON READER SERVICE CARD

She wanted to know if I wanted the program to name the payees of each check? The purpose of each check? The source of eech deposit? Should it have the capacity to keep track of several checking accounts simultaneously with eutomatic entry of each account number? No way, I retorted. I just want the thing to add and

SEVERAL WEEKS of trauma and dismay have ended with the realization that if others can do it, I can too.

subtract checks, deposits, interest, and servlce charges so thet I can figure out how much I have in the account or how much I had better get into the bank before the checks started bouncing. Luckily, she's e former day care teacher and familiar with the concept of helping others learn step by step.

Whet were all those strings with no definitions? she asked. Well, I explained, I thought I needed them, but I didn't. Why wes I plenning a separate string for eech transaction? she asked. Well, I didn't know how else to do it. Gradually, as she tore apart the illogic of my previous efforts—leaving little more than the name of my program and a few PRINT lines intact—the light began to dawn. Graduelly. Slowly. Very gradually and slowly. But things were looking up.

I figured out how to provide different options in the same command: 130 INPUT "Enter 1 for deposit. Enter 2 for check. Enter 3 for service charge. Enter 4 for interest. Enter 5 for no more transactions. ",Y. I wondered what should heppen if someone entered something other than 1–5, then proudly typed in IF Y>5 THEN GOTO 200. Line 200 read PRINT "You can enter only 1,2,3,4 or 5.": GOTO 130. And line 130 was the input for the type of transaction. After more triel and many more errors, my IF THEN GOTOs were actually looping. They weren't inspired or greet loops, maybe not even very good loops, but they were certainly better loops than before. The manuel even started to make more sense.

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CIRCLE 449 ON READER SERVICE CARD

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PC

CIRCLE 434 ON READER SERVICE CARD

Don't think tha frustrations disappeared. I repeatedly tried running the revisions and often found the seeming ineviteble "Syntax error in line XYZ." Below this gloomy message would be Line XYZ. Sometimes it wes a simple typo such as a misplaced or missing comma, but avan these minor errors aren't elways noticed by the tired espiring programmers of the world. Other times the goofs were more serious, a GOTO to a nonexistent lina or an undefined string.

Small successes taka a toll. Instead of remaining in the valley of the doldrums as I had at the start of my mission, my spirits mounted when things went well. Of course, this meant a more peinful fall when something went poorly.

More test runs. More claaning up littla snafus. And it worked. My deposits end interest peyments were addad, my checks and service charges were subtracted, end when all my transactions had been entered, Freedmon's Eosy Checkbook Bolancer (see Figure 1) told me "Your closing balanca at (today's data) is $."

I still don't know the meaning of "Option Base Statement" or "MID$ Function end Statement," or "BLOAD Command," but I now know thet I can learn it if necessary.

Sevaral weeks of trauma and dismay heve ended with the reelization thet if others can do it, I can too. Even with a few painful belly-flops elong the way. I did lt, even if "it" isn't tha most sophisticatad check balencing program ever designed for the microcomputer. From Mission Impossible to Mission Accomplished. My instructor had said, "You've got to earn the ability to progrem. It's not a gift," and I'd started paying my dues.

Now I wonder if *Freedman's Eosy Checkbook Boloncer* should be refined. Maybe I can get it to keep tabs on my tax-deductible expenditures—or print negetive balances in red on e color monitor. Maybe my BEEP can be replaced by a few funeral notes with some sound experimentetion. Meybe. */PC*

Figure 1: Program listing for Freedman's Easy Checkbook Balancer.

```
10 PRINT:
20 PRINT: PRINT:
30 PRINT "Freedman's Easy Checkbook Balancer"
40 PRINT "By Eric Freedman"
50 PRINT: PRINT: PRINT:
60 PRINT "With this program, you'll be able
     to keep your checkbook balanced."
70 PRINT "It will also alert you with a beep
     if your balance dips precariously below $0."
80 PRINT:PRINT:
90 INPUT "Today's date is? Example 05-02-83 ",B$
100 INPUT "Your previous balance was?
     Example 100.00  $",X
110 INPUT "Date of transaction. Example 05-02-83 ",A$
120 INPUT "Enter 1 for deposit. Enter 2 for check.
     Enter 3 for service charge. Enter 4 for
     interest. Enter 5 for no more transaction.  ",Y
130 IF Y=5 THEN GOTO 270
140 IF Y>5 THEN GOTO 210
150 INPUT "Amount of transaction is? $",M
160 IF Y=1 THEN GOTO 220
170 IF Y=2 THEN GOTO 240
180 IF Y=3 THEN GOTO 240
190 IF Y=4 THEN GOTO 220
200 IF Y>5 THEN GOTO 210
210 PRINT "You can enter only 1,2,3,4 or 5." : GOTO 120
220 X=X+M: PRINT "$"X
230 GOTO 120
240 X=X-M: IF X<0 THEN BEEP
250 PRINT "$"X
260 GOTO 120
270 PRINT "Your closing balance at " B$ " is  $"X
```

PC ARCADE/COREY SANDLER

The PC Arcade has begun to attract a new kind of clientele: toddlers. But there's still room for checkers fans and armchair stock market speculators.

From Sesame Street To Wall Street

In tha interasts of full disclosure, I must admit that I hava a special interest in two of the software packages reviewed this month: *My Letters Numbers ond Words* and *Early Games for Young Children*.

You see, my very own softwear package arrived at the end of July. (You might be interested in this latest modal, a fully portable, 7-pound, 7-ounce micro called tha "Willie." He came equipped with an organic microprocessor, a waste disposal system with a built-in parallel port, and multiple voice sound. And designer Janice was particularly pleased that the naw model—our first—was rushad to the market in record time, only 9 months from conception to delivery.)

I've begun collacting a few aarly childhood games, these two among them. We'll deal mostly with the fun valua in this column; watch for stories in coming issues about aducational valua and theory. You might want to consult Marianne Paul's article ("Child's Play: Preschoolers And The PC") in this issue about her 24-month-old PC user.

My Letters Numbers and Words
Stone Software Markating, Inc.
7910 Ivanhoe Ave., #319
La Jolla, CA 92037
(619) 459-9173
List Price: $39.95
Requires: 64K, one disk drive, DOS 1.1, color/graphics adapter and color or graphics-capabla monochroma monitor.

CIRCLE 700 ON READER SERVICE CARD

This program is cuta as a button, with

Screen displays from My Letters Numbers and Words. *Spell the word correctly, and the beautifully designed pictures come to life.*

great evidence of the effects of a loving parent on its development. My Letters Numbers ond Words is billed as educatlonal software for children from 1 to 5. It is a wonderfully designed and executed expedition into recognition of latter and number shepes end identification of your basic baby pictures: cars, cows, ducks, and that sort of thing.

My Letters Numbers ond Words is, et heart, a computer interactive version of "Sesame Street." A colorful and datailed picture of a cuta pet, tail wegging end ears wobbling, bounds on the screen end waits for someone to type in "P-U-P-P-Y." A bumbershoot is pelted by rain drops, awaiting entry of "U-M-B-R-E-L-L-A." The number 3 appears, end the user is supposad to typa in "T-H-R-E-E." When ha does, three objects, in this case, geese, pop on the screen. Another form of quiz in My Letters Numbers ond Words involves matching a letter on the screen with its mate on the keyboard.

This is not merely an exercise in programming; the drawings end the lettering are obviously tha result of an artist's hend.

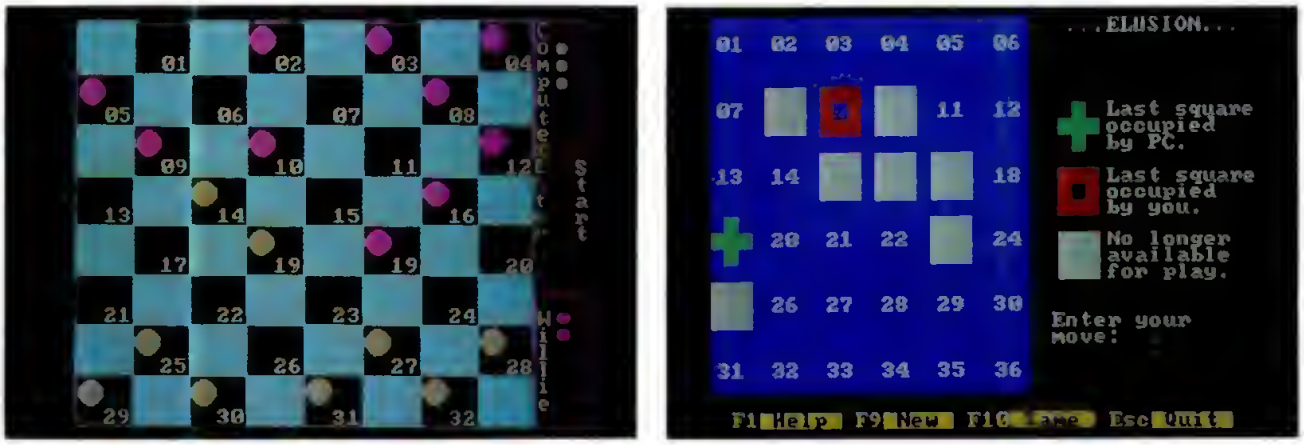
Tha gama/education worked as advertised, without any serious bugs, on a PC and a PC-XT. (It would not, though, do its tricks on the Hyperion competible. Among other things, it kept freezing up whenaver it came to the word "Lion." Meybe thay're scarad of large felines in Canada, where the Hyperion is mede? I suspact thera may ba problams with this program on other would-be "compatibles.")

WE OLDSTERS all sat around the office one afternoon going goo-goo and gah-gah over the graphics.

Despite my enthusiasm, I do heve a few questions: This program is billed as being for children from 1 to 5 yeers of age. To begin with, this is quite a span. Also, I question the velue of learning to spall "UMBRELLA" for a 12-month-old baby, even the likes of my Willie. What exactly is being taught here: typing skills? Motor skills? Spelling? According to enother proud fathar hare in the office, a more reasonabla aga assignmant for most of this progrem would be 3 or 4 yaars of aga.

In any casa, this is a very well-dasigned and ettractive package and worthy of consideretion for children of all ages. Bill Mechrona's 2-year-old Staphanie was anthrallad with tha pictures, and long after

Number series for My Letters Numbers and Words. Spell out the number and you are rewarded with an animated-cartoon display: T-H-R-E-E, three geese march off the screen.



Four screens from IBM's solid Strategy Games series. From left to right: Checkers for Beginners, Elusion, Battleship, *and* Reversi.

the program was off, pleyed hunt-and-peck on a terminal keyboard looking for the letter *E*.

EARLY Games was certainly lacking in the attractive and attention-grabbing graphics employed by My Letters etc.

We oldsters all sat around the office one afternoon going goo-goo and gah-gah over the graphics. Maybe it helped our spelling, too.

On the PC Mogazine rating scale of one to six, and in my judgment of the interest level of a very young child, *My Letters Numbers and Words* rates

FUN:	4.5
CHALLENGE:	4.5
GRAPHICS/SOUND:	5.5
TOTAL:	14.5

Early Games for Young Children
Counterpoint Software Inc., #218
4005 West 65th St.
Edina, MN 55435
(800) 328-1223
(612) 544-4720
List Price: $29.95
Requires: 48K, color/graphics adapter, color monitor.

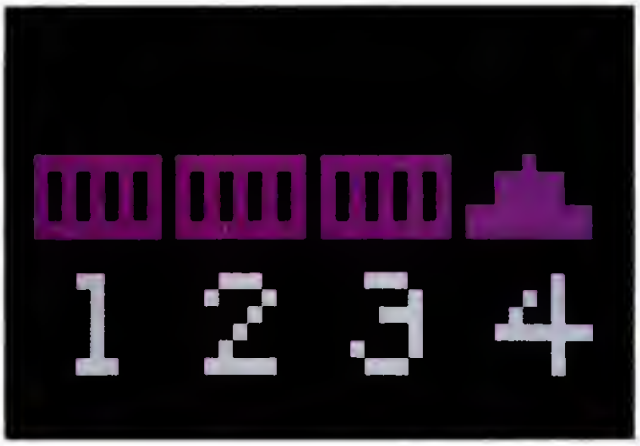
CIRCLE 699 ON READER SERVICE CARD

This program, *Eorly Games for Young Children*, suffers only by comparison to *My Letters*, etc. This is a package of nine "learning games" aimed at children from 2½ to 6 yeers of age, according to the author.

The games ask the child to match the number on the screen with the number on the keyboard, count the blocks on the screen and type the correct number, add stacks of blocks together, subtract one stack of blocks from another, metcb letters, play with the alphabet, learn to type his name, end compare shapes. The ninth exercise turns the PC screen into a blank blackboard for drawing and coloring.

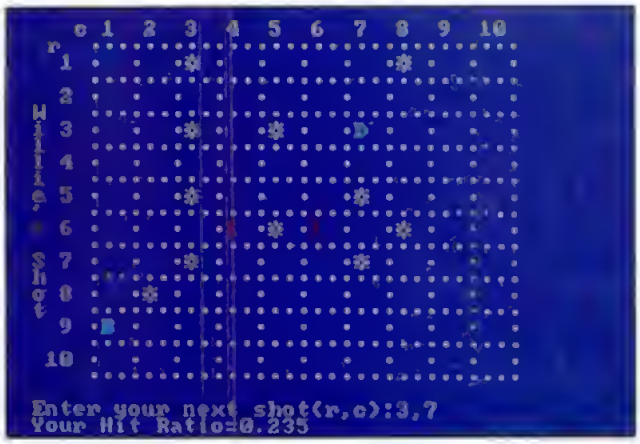
Tbe program worked as advertised. I suspect thet the block-counting and letter-matching exercises of this package meybe quite eppropriate for very young children, but *Eorly Gomes* was certainly lacking in the attractive and attention-grabbing graphics employed by *My Letters*, etc.

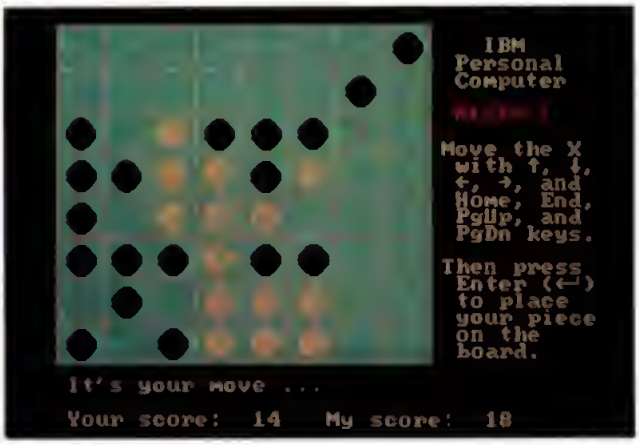
One reel plus of this peckage is the design of the "menu" for selection of games by the child. Pictograms repre-



A simple screen from well-intentioned but less-thon-flashy Early Games for Young Children.

A screen from Willie's portfolio in Computer Stocks & Bonds. *If you can't read them, don't blame us. We couldn't either.*





senting eech of the nine options merch ecross the screen; all the child hes to do is strike any key when he sees the one he wents. (This is not e bed structure for any program, for thet metter. Even Apple's Lise computer relies heevily on pictures insteed of words.)

On PC's rating scele of one to six, Eorly Gomes eerns

FUN:	4.0
CHALLENGE:	3.5
GRAPHICS/SOUND:	3.0
TOTAL:	10.5

Strategy Gomes
IBM Personel Computer Enterteinment Series
IBM Corporation
Boca Raton, Floride 33432
List Price: $30
Requires: 64K, disk drive, color/grephics adepter, color or grephics-capable monochrome monitor.

CIRCLE 698 ON READER SERVICE CARD

Good old rock-solid conservetive IBM has come up with four good old (and new) rock-solid conservative games in the Strategy Gomes peckage. Encesed in a demure grey IBM folder are *Checkers for Beginners*, Elusion, *Bottleship*, end Reversi. The first end lest of the set, in my opinion, are worth the purchase of this package; the middle two are eccepteble changes of pece.

The entire package is well-constructed. The opening menu includes the option of selecting color or monochrome displey (using the required color/graphics edepter). You can also edjust the position of the imege on the screen, sometimes necessary if you are using e color television instead of e computer monitor. The instruction menuel is every bit es good es IBM's other books. The program ellows you to make one backup copy and then the disk becomes locked off.

The Checkers Speech

Checkers for Beginners is, well, checkers. You ere presented with e screen with the familiar 12- egainst 12-disks. Each of the dark pleying spots is numbered; you make e move by first typing the position of the checker to be moved, and then the spot it is to be moved to. If you are going to "jump" en opponent's checker in e diegonel move, you just specify the before end after numbers. If you've set up a double or triple jump, the program will recognize this end ellow for multiple moves.

I WAS quite surprised and perhaps a bit disappointed to find my PC such a pushover.

As each checker is removed from the pleying board, e minieture representative shows up in e holding pen alongside the screen. If you manage to make it ell the wey to the enemy's first row, your checker is "crowned" and made into e king, the only piece thet can move beckward and forward.

Now, it is beyond my background to comment on the quality of play of *Checkers for Beginners* except to say that 1) I've never considered myself e wizard at checkers, 2) I don't think I've played the game in 20 years or so, and 3) I beat the computer when I set the pleying level et "1." (There is a second, more advanced level eveileble.) I enjoyed the geme, and I could easily see how one wrong move on my part could have changed the outcome, but I must admit I was quite surprised and perhaps a bit disappointed to find my PC such e pushover.

The game is well-designed, as you might expect from IBM, including one rather intriguing touch: When it is the computer's turn, you see the word "thinking" on the screen. You can also hear a series of beeps. If you hear a high-pitched beep, the computer is pleased with itself and its move; if you hear e low-pitched beep, the computer has resigned itself to making e move it is unhappy with.

There are e few minor irritations: When I had moved in for the kill, and the computer had only one possible move, it took 8 full seconds before I could savor

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victory. Another defect involves the input of moves. Apparently the before and after positions are accepted as separate strings by tha program, and I consistently got an error message from the program when I tried to antar ona after the othar too quickly. I was unabla to crash the program, though.

A New Deception

Elusion is a new game created for the PC, according to IBM. The object of the game is to ba abla to make the last move on the board, playing against the computer or another buman being. You can choose a 5-by-5 grid or a more difficult 6-by-6 grid.

Squares can be taken only once, and once a square is chosen it is a blocker. You must make your move from the position you last took—therafore the strategy of the game involves finding a way to box in your opponent. The computer plays a pretty tough game here, too.

Standing by itself, Elusion would win no prizes for challenge. As part of the packaga, though, it was worth a few passas.

Battleship, Again

Battleship is a hoary old favorite, dating back to the days of World War I. In those pre-PC days it was played with pencils and paper. Now, it is a common strategy game on most micros.

The object is to sink your opponent's navy by guessing wbere ships and submarines have been hidden. There are three different modes of play: You try to sink tha computer's navy, you and the computer shoot at each other, and you and a friend take altarnata potshots at eacb other's armadas.

IBM's version includes a few nice

AVALON Hill has not yet made a successful transition to the IBM PC, at least not with Computer Stocks & Bonds.

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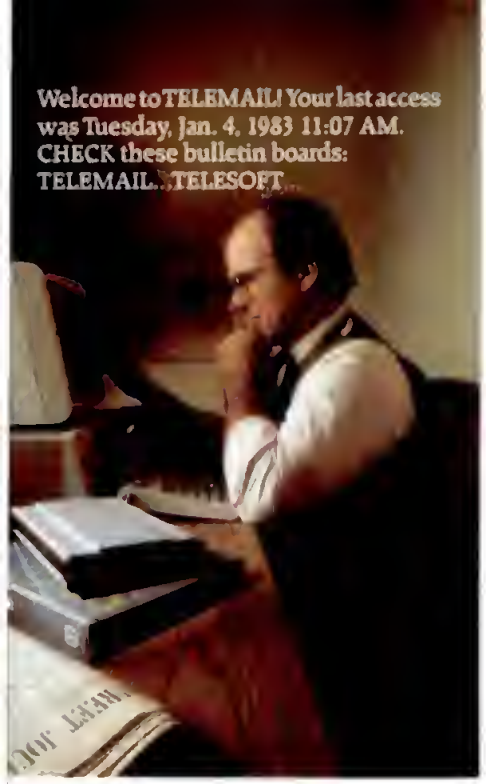
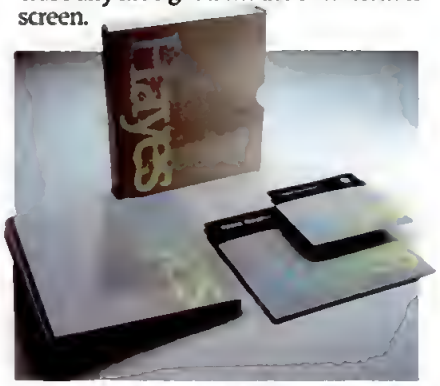


prompt, message or parameter that will get you on your way in no time.

Smartcom II also provides a directory of the files stored on your disk. You can create, display, list, name, re-name or erase any file right from the Smartcom II screen.



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touches. One presents at the bottom of the screen a running "hit ratio"—sort of a batting average. If you take 12 shots and hit four ships, your hit ratio would be .333. When the game is over, you get a final box score.

The Champ

This one is the champ, a computer update of a 100-year-old British game called "Halma." It is, in its way, a link between checkers and chess, requiring planning of moves several turns ahead.

The object of Reversi is to occupy the most squares on the board at the end of the game. You are allowed to place one of your colored markers on any empty space in a horizontal, vertical, or diagonal line that includes another of your markers. When you do so, all of your opponent's pieces in between change colors and become yours. Your capture may be short-lived, though, for the computer is likely to find a way to turn the tide.

The game was a real challenge; movement was easy using the cursor keys, and the screen itself is attractively designed. A minor nit: The on-screen instructions say your pieces are white; yet in the display on a color RGB screen they were red.

On PC's game rating scale of one to six, the entire *IBM Strategy Games Package* earns

FUN:	4.5
CHALLENGE:	5.0
GRAPHICS/SOUND:	4.0
TOTAL:	13.5

Computer Stocks & Bonds
Microcomputer Games, Inc.
The Avalon-Hill Game Co.
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Baltimore, MD 21214
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List price: $25
Requires: 64K, color/graphics or monochrome adapter, appropriate monitor.

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Now, one of my fondest hopes is that Willie will be more adept with the contents of his piggy bank than I am with mine. I'm not sure, though, that *Computer Stocks & Bonds* will be the answer.

It's a bit disappointing to weigh this package in the light of its illustrious parentage: The Avalon Hill Game Company (A-H) has been producing some of the more enjoyable and well-constructed board games for many years. I've long been a fan of its "Facts in Five," and its baseball, basketball, and football simulations boast devoted followers everywhere.

YOU'LL SEE a great big "BULL" or "BEAR" screen indicating the market's direction.

However, Avalon Hill has not yet made a successful transition to the IBM PC, at least not with *Computer Stocks & Bonds*. The graphics are very weak and unimaginative, the play of the game is S-L-O-W and there is no advantage taken of features of the PC such as cursor keys and function keys. I would suspect that this is a quick (and dirty) translation from another microcomputer version.

Computer Stocks & Bonds is, at heart, almost identical to *Millionaire*, a stock market simulation reviewed earlier in PC. The point is to accumulate a fortune through the purchase and sale of securities, predicting market and general economic trends, and landing on the right side of random chance. Between turns you'll see news flashes and a great big "BULL" or "BEAR" screen indicating the market's direction. After you make your sales or purchases, your portfolio will be updated on screen. The course of the market game is 10 weeks.

Among the graphic and operational faults of *Computer Stocks & Bonds* appears to be a lack of attention to color RGB display. The screen's colors included a hazy yellow against white and muddy red against white, a most unfriendly combination. The display on a monochrome screen driven by the PC's monochrome adapter was sharp and clear—and only half a screen wide.

We deserve better from Avalon Hill.

FUN:	2.5
CHALLENGE:	2.5
GRAPHICS/SOUND:	1.0
TOTAL:	6.0

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MARK ZACHMANN

Break signals, printer feeders, polyphonic sounds, and Intel's new chips are discussed in this session with the PC Tutor.

PC Tutor

Give Me a Break!

Q: We purchased our IBM PC to interface with our mainframe timesharing system. The IBM Asynchronous Support Package we bought did not contain the timesharing protocol we needed, so I modified the COMM.BAS program which came with the PC-DOS disk. Now we can download, upload, and dump to printer. However we still cannot send a Break command through to the timesharing system.

Is there a simple way for BASIC to send the Break command?

Bob Lewis
Santa Ana, California

A: *Break is not really a character at all. Instead, it amounts to turning off the serial port for a short period of time—about 0.3 seconds. You can accomplish this with some port I/O instructions. Take a look at Figure 1 (below). The program works by setting bit 6 of the serial port's Line Control Register (the "Set Break" bit) to a 1, waiting 0.3 seconds, and then setting the bit back to a 0.*

Entering the Background

Q: How can I write a program that runs in the "background" under PC-DOS 2.0? The PRINT program of PC-DOS somehow sets up a background process that can access the disk and the printer when the machine is not busy. However, I can find no PC-DOS function call (other than those labeled "used internally by DOS") that might support this.

Steven Simanaff
Brighton, Massachusetts

A: *Writing background tasks is not a simple matter. For one thing, I believe you are correct in thinking that part of the key lies in using the "used internally by DOS" calls that are undocumented. I find this particular statement (used to describe the new PC-DOS 2.0 calls 32, 34, and 37) somewhat irritating.*

Nevertheless, if you are willing to restrict your programs to certain non-file-oriented tasks, you can write a background procedure. The procedure will be initiated like any other PC-DOS program, but it should exit using DOS 2.0 call number 31 ("terminate process and remain resident"). This will leave the program resident in memory. You can then have another program call the background task, or have it run whenever a hardware interrupt, like the PRINT routine, occurs.

The major problem with writing a background procedure is that PC-DOS has a history of not being very friendly when it comes to programs sharing files. The PC-DOS 2.0 documentation does not say whether your background task can open a file, read/write it, and then close it without interfering with the foreground program. You might wish to experiment with the background program by using the new ASCIIZ file protocols while a foreground program is doing file operations.

You might find that when a foreground program exits, PC-DOS will automatically close your background file. You certainly

Figure 1: A BASIC program to produce a Break signal.

```
1    REM Assumes serial port
10   REM First read the old value
20   LCR = &h3FB : OLD = INP (LCR%)
30   REM Turn on the break (6th) bit
40   OUT LCR,OLD OR &h40
50   REM Wait .3 seconds
60   SOUND 32767,6 : SOUND 32767,1
70   REM Turn off the break bit
80   OUT LCR,OLD
```

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would not want to manipulate a file that the foreground program is using. Similarly, you would probably not want to append to files from the background task, as this would change file allocation parameters.

*If you want a way to switch between the background and foreground tasks alternately, check into the timer interrupt (INT 1C hex). The BIOS of the PC calls this interrupt 18.2 times per second. By putting the address of your task switcher at location 0000:0070 (4*1C), the IBM BIOS will call your switcher every 5.5 milliseconds.*

A Switch Solution

A number of readers wrote in with a solution to the problem James Bettman had with his NEC 8023 printer (see "PC Tutor," PC, Volume 2 Number 2). Apparently his printer would not dump the screen correctly when he used Shift-PrtSc. All you need to do is set switch 1-7 to closed.

MOST copy-protected programs cannot be transferred to a hard disk.

Another suggestion was to set switch 1-6 to closed. You might wish to try this as well.

Thanks to George Avrunin of Amherst, Massachusetts, and others.

Protected From Hard Disks

Q: I use an IBM mainframe in my job and enjoy having all of my programs and files on-line on a hard disk. I would like to get a hard disk for my PC so that I can avoid the inconvenience of constantly inserting and pulling out floppy disks. Several of the programs I have purchased, however, are copy-protected. Is it possible to copy these programs onto the hard disk so that I can avoid the inconvenience of floppies?

Gregory Slutz
Singapore

A: Most copy-protected programs cannot be transferred to a hard disk. The methods work by checking your disk to make sure that it is in the manufacturer's nonstandard format. Since your hard disk will not agree with the format the routine is looking for, the program will refuse to run. You will find that you just cannot transfer the program to the hard disk—that's the idea of "copy-protection."

For many of these programs, you at least can put your data files on the hard disk, which should save a fair amount of hassling with floppies. I suggest you talk to the software's manufacturer or check the program's documentation to see if it says anything about hard disk support. For corporate customers, some manufacturers are willing to sell a license that allows the company to put a copy of the program on a shared hard disk.

Changing Formulas

Q: For an application, I wrote a program that evaluates many different variables and returns an answer. With each pass through the program, the variables must be evaluated with one of many different formulas. Because of the nature of the application it is often impossible to predict which specific formula will be needed.

I need to be able to have a program line that prompts the user to enter the appropriate formula. As far as I have been able to determine, IBM BASIC does not provide a way to input a formula into a running program. Is there a way to do this?

Randolph R. Madere
Forest Park, Illinois

A: A couple of approaches spring to mind; all use BASIC's MERGE command. By far the most simple approach is to include the statement: MERGE "CON". With this command, the computer will wait for input from the user; you should PRINT a prompt first. Input is considered finished when the user types a Ctrl-Z. Any valid lines the user types will actually be entered into your program. A simple way to do this is shown in Figure 2.

PC-DOS has a history of not being very friendly when it comes to programs sharing files.

In order to use this approach, the user must first enter the correct line number, and then a valid BASIC code. If you wish to manipulate the user's input, then another approach, which is slightly tougher to write, can be used successfully.

In that case, after massaging the user input, you create a file and write the desired BASIC code into the file. Follow this by using the MERGE command with that file name. If all goes well, your new lines will be entered into the running program.

Foreign Powers

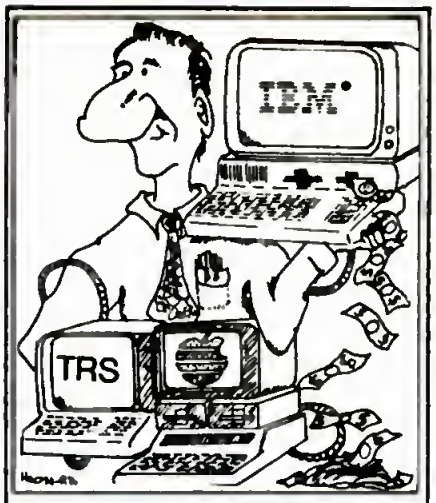
Q: I am considering purchasing an IBM PC, but I live in an area with a power line frequency of 50 Hz (unlike the frequency of 60 Hz in the United States). Will this cause trouble with the PC?

William Kalina
APO New York, New York

I am convinced that a personal computer will be of much help in my work. The IBM PC seems to fit the bill, but I have one

Figure 2: A BASIC routine showing how to apply the MERGE command to use a formula input by the user.

```
10      REM Main Program
20      PRINT "Please enter the new line: ";
30      REM Now the user will enter something
40      MERGE "CON"
50      REM Hopefully at line 1000
60      GOSUB 1000
70      END
1000    REM This line gets written over
1010    RETURN
```

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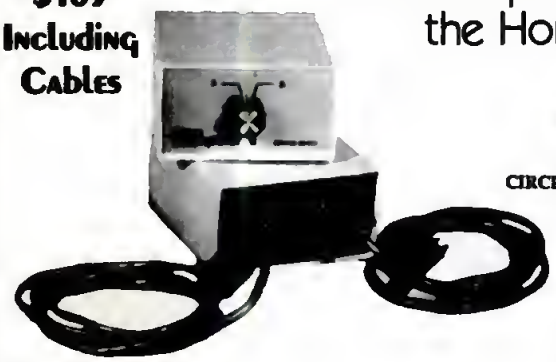

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CIRCLE 310 ON READER SERVICE CARD

question. Is it possible to get the IBM PC with a keyboard containing the six characters needed for word processing in Spanish?

Jas Reuter
Coyoacan, Mexico

YOU CAN safely and relatively painlessly use a serial printer with the PC.

A: *IBM is now shipping and selling IBM PCs to o number of foreign countries. These are not necessarily stock IBM PCs; I believe they hove custom power supplies and keyboards. You should contact the nearest IBM representative in your region and osk him whether o version designed for thot country exists. I would not use o stock PC with o 50 Hz supply. I can also guarantee that the stateside PCs do not have the Spanish character set.*

As for foreign PCs, I hove not seen any of them, but you'd think thot IBM would understand thot people in other countries write languoges other than English.

Finding o word processor thot speaks o languoge other than English moy well be more difficult than finding o foreign languoge keyboard for the PC.

Matching a Feeder

Q: *I am trying to find a letter-quality printer to use with my father's IBM PC in his business in Miami, Florida. I'm having a problem because he must have a double-bin, automatic sheet feeder.*

He likes the NEC Spinwriter best of the printers he's seen. Unfortunately, he's been told that because of "compatibility problems" with the rest of NEC's printers, the 3550 is the only model that works reliably with the PC. However, the double-bin sheet feeder NEC makes for its printers doesn't seem to work too well, although there are some reliable feeders available for the other NEC printers.

Further, we have been unable to find e word processing program able to use an automatic sheet feeder. We have considered using WordStar/InfoStar since he needs to do a considerable amount of sort-

ing/indexing, but these programs will not support an NEC feeder—even if one worked. No other word processing program I've checked into can utilize the NEC feeder either.

Can you suggest any letter-quality printer/feeder and word processor/indexing combinations for the IBM PC that will work together?

Doug Hazen, Jr.
Gainesville, Florida

A: I can suggest a valid approach, but it may not be as simple as using WordStar/InfoStar. You do not say if you need an integrated word processor/indexer, or if the two operations can work separately. If they are separate, then you might wish to consider a good pair of programs from different manufacturers.

On the subject of printers and sheet feeders: I suggest you first find a combination of printer/feeder that seems attractive. This may very well be the NEC 3550 with an appropriate feeder. You could also use the other NEC printers or one of the daisy wheel (not thimble) printers. There are a number of word processing programs on the market that support these printers.

For example, WordStar version 3.0 will support the Qume/Sprint printers, although without proportional spacing. The Final Word (by Mark of the Unicorn) and Edix/Wordix (by Emerging Technologies Consultants, Inc.) both support various letter quality printers with and without proportional spacing. The Final Word is somewhat more versatile when it comes to proportional spacing, while Wordix has more versatility when it comes to page formatting—it also includes some simple mail merge features.

To the best of my knowledge, all of these programs will support a sheet feeder, if you take care. An automatic sheet feeder will signal the computer when the sheet is being fed in so that the word processing program does not overflow the printer. This operation should look transparent to the computer. The word processing program cannot tell the difference between a pause for a sheet to be fed in and the printer having to pause while a buffer gets emptied.

You will have difficulty using printers other than the NEC 3550 with standard IBM printing software, such as the Print-Screen feature. If you don't mind losing some features, and really only wish to make sure that the word processor works with the printer, then you may select any desirable letter-quality printer.

If you require proportional spacing (which would put WordStar out of consideration), then you need to find a database program to use with the word processor you select. Proper selection of a database management package depends greatly on how complex your requirements are and how large the database is. Recommendations would require more information than your letter contained.

I LIVE in an area with a power line frequency of 50 Hz. Will this cause trouble with the PC?

Preserving a Printer

Q: I have two related questions about moving up to the IBM PC. My present computer system comprises a NorthStar Horizon with 64K, a DEC VT-100 terminal, and an NEC 5510 Spinwriter; my collection of software includes *Magic Wand* (now *PeachText*), dBase II, Microsoft BASIC, and perhaps 100 disks of files under CP/M 2.2.

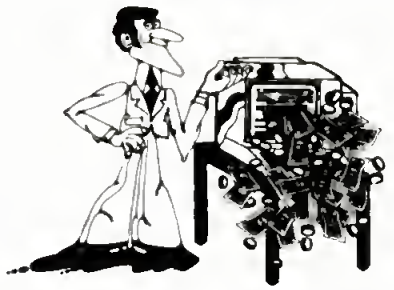
First, while I can see selling my "old" computer and terminal, what about the printer? The people at the IBM product centers insist that IBM does not support serial printers. Also the NEC 5510 uses different control codes from those of the IBM standard NEC 3550 printer.

Second, what of the fruits of my writing for nearly 3 years? Before I dispose of the NorthStar and terminal, can these be used to PIP (the CP/M equivalent of COPY) them onto IBM soft-sectored diskettes? And can my dBase II and its files and my MicroSoft BASIC programs be converted to IBM format?

Craig Stark
Montclair, New Jersey

A: I think you will find that you can keep most of your work and investment intact.

First, despite the claims of the IBM



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center salespeople, you can safely and relatively painlessly use a serial printer with the PC. PC-DOS contains a program called MODE that lets you fool software into believing that the printer is connected to the parallel port. There are some problems with handshaking so you may have to run at only 30 cps, unless your software supports serial protocols. You can forget about running some software packages available for the IBM PC, as these will—at best—assume you are using the NEC 3550, which has different control codes.

A number of text editors, including WordStar, will support serial printers at full speed with standard serial (ETX/ACK) handshaking. (See my answer to a question about sheet feeders to find some suggested programs.) Peach Text will also support the 5510.

Thus, at worst, your text editor will support the printer at full-speed, while some standard but less sophisticated IBM PC programs will force you to run at only 30 cps. Note that it would not be too difficult to write a device driver for your printer to make it seem just like the 3550, if you have a friend who can use assembly code.

As for transferring information from a CP/M system, that is a simple but time-consuming task. I have done this with a large number of systems. The easiest approach is to transfer the information via serial ports. If you can find a program that will talk the same protocol on both sides of the serial port, you should be able to transfer all of your files—binary program files as well as ASCII character files.

THE problem is that the two disk formats—hard sectored and soft sectored—are incompatible.

Probably the most common protocol is MODEM7 protocol. You can get a free program from CP/M user groups that will run on your NorthStar and speak that language. A number of programs are available for the IBM PC that also communicate using MODEM7 protocol. This will restrict you to 9600 baud, and that rate only if the NorthStar can handle it. At that speed it will take about 30 seconds to transfer a 30KB file; that should give an idea of the time involved. I don't know of a faster method offhand.

YOUR BASIC programs will be almost completely transportable from one machine to the other.

The problem is that the two disk formats—hard sectored and soft sectored—are incompatible. The only machine I know of that will read both is the Apple II, but I doubt the appropriate software is available for it.

You can use PIP to transfer to files that are in ASCII, such as your BASIC programs. (I assume this is also the case with the PeachText files.) You can save the BASIC program by using the ,A option (as in SAVE "PROG",A) and turn the programs into ASCII characters readable by CP/M's PIP and the IBM PC.

If the NorthStar supports IOBYTE, then just redirect the IOBYTE so that some device, such as PUN, is the serial port, to be run as fast as possible. Then, on the PC do the following:

A>MODE COM1:9600,N,7

This will set up the PC serial port (COM1) for 9600 baud, no parity, and seven data bits (adequate for ASCII). Follow up by keying in this on the NorthStar:

A>PIP PUN:=MYFILE

(I assume PUN: is your serial port, as it is on an Osborne). To change the PUN to your serial port you will need the appropriate syntax for the STAT program. See your CP/M manual for the correct form. Then key in this on the PC:

A>COPY COM1 MYFILE

Note that PIP and COPY have reversed syntax. This will actually transfer an ASCII file with very little effort.

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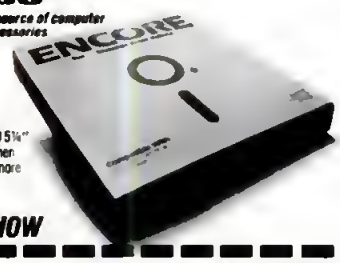

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CIRCLE 270 ON READER SERVICE CARD

As for compotobility, dBase II ond PeachText files hove the same loyout on either mochine.

Your BASIC programs will be olmost completely tronsportoble from one mochine to the other. Differences will be primarily due to changes in console output in programs thot took odvantoge of the VT-100 smart terminol thot must be odopted for the PC's memory mopped disploy.

I recently finished transferring ond converting o long (100K) BASIC program from the Osborne to the PC; the whole process took less thon 6 hours.

Weird Precision

Q: My IBM PC gives some weird answers when it computes in double precision. When the arctangent function is evalueted at 1, the result should be PI/4. In fact, the result I get is accurate to only six decimal places.

Do I have a faulty copy of BASIC? An earlier version had difficulty with double precision, but ComputerLand geve me the corrected version (1.05).

Joe Elich
Logen, Utah

A: *The answer to your question is straightforward. Like ony languoge without support for the 8087 (the optional numeric coprocessor), the IBM BASIC performs orctangent computotion using an algorithm. According to the BASIC manuol, orctangents ore olwoys colculoted in single precision, hence your loss in occurocy. This does speed up the computotion considerobly, however.*

EEPROM Alternatives

Q: One of the main reasons why I would want to buy a hard disk for my PC is for convenient storage of programs. But could I save money and gain more convenience by adding EEPROMs and loeding the program onto them?

Dan Proctor
Cambridge, Massechusetts

A: *I think you would find the EEPROMs (erosoble, programmoble non-volotile storoge chips) are decidedly not cost-effective. For obout $3,000 you can purchose o hord disk with 10MB of memory. This will hold perhops 100 programs. The same omount of money would buy you opproximotely 300K of EEPROMs (not counting the cards to mount the chips) thot would hold perhops three programs.*

ALTHOUGH EEPROMs are suitable for a number of purposes, economical storage of common microcomputer programs is not one of them.

Furthermore, 300K of EEPROMs would require obout 300 chips. Considering thot the largest ovoiloble memory cord for the PC holds 64 memory chips, you would need ot leost five boards to hold oll of those EEPROMs—perhops more, becouse EEPROMs ore much larger than RAM memory chips.

Although EEPROMs are designed to be suitoble for o number of purposes, economical storoge of common microcomputer programs is not one of them.

Polyphonic Programming

Q: I have been trying unsuccessfully to produce polyphonic sounds out of my IBM PC. The manuals glibly tell you that this is possible but they neglect to say how to do this. Can you describe how this is done? I would prefer an answer in BASIC, but assembler would be OK.

John Schoenberger
Fairport, New York

A: *Yes the PC can produce polyphonic sounds, depending on your definition of polyphonic. The PC's internal speaker is connected to the output of one of the counter timers (timer 2). This timer can be programmed to produce o square wove output, which then drives the speaker to make sounds. You can also use o porallel port to switch the speaker on ond off (given the timer output). Finolly, the clock input to the timer can be turned on and off by another port, effectively moduloting the clock frequency. The combinotion of*

these three modes of control con be used to produce palyphony.

For o look ot how to program the 8253 timer counter, you should exomine an Intel components manuol. The code segment on page A-18 of the Technical Reference Monuol will show how to use the timer/counter olong with the parollel port.

Now, whot obout generoting palyphony? Well, ony woveform con be opproximoted by rectongulor woves. This is o subject woy beyond the scope of "PC Tutor," however. For more detoiled informotion I suggest you check the Journal of the Audio Engineering Society of America (JAES). In the mid-1970s it included o few interesting orticles obout synthesizing woveforms by means other thon fourier analysis (which works with sinusoids). The technique used o digitol opproach; I believe the outhor wos ot Stanford University. I wish I could remember more, but, in any cose, neither the softwore nor the hordware interfocing is o trivial motter.

Comments On Chips

I recently hod o very interesting chot with on engineer from Intel. The company seems for friendlier than most. In ony case, I'd like to pass on some of the informotion thot come up:

Last month I wrote obout Intel's 80186 ond 80286 microprocessors. Since then, I hove read some specificotion sheets and realized thot the 80286 is substontiolly foster thon the 80186. Not only is the oddress calculotion sped up (os I mentioned before) but olso some particulor 80286 instructions hove been sped up. I don't know how this wos done, nor why it wos not done with the 80186.

A number of people hove osked for tutoriols on the IBM Mocro Assembler. Intel produces o very short booklet entitled "An Introduction to ASM88," which these readers should see. This booklet is o very readoble introduction. Although there are some differences between this and the IBM moterial, it clearly ond concisely describes how to use odvonced features of the Mocro Assembler, such os segments, separote compilotion and linkoges, ond procedures. It olso describes the uses of for and near calls and lobels. In foct, most of the missing informotion from IBM's Mocro Assembler manual seems to be nicely spelled out in this booklet. MicroSoft and IBM should toke o few lessons from Intel. If you wont o copy, order Intel #121689-001 (which costs $7.50) from your locol Intel distributor.

There hos been some confusion over whether or not o motched pair of 8088/8087 chips is required to run the Intel motch co-processor. I learned thot you can tell by inspecting your 8088 whether it will work with o 8087. Just look ot the morkings on the top of the chip. If the chip is morked with o 1981 copyright (you will see "©'78'81" on the top of the chip), then it is sure to work with an 8087.

Older chips (with only "©'78" printed on it) moy olso work. Look ot the upper portion of the chip. If the morking soys "P8088" or "D8088" (the P or D just means it is o plostic or ceromic 8088) followed by "S4716," then the chip is o revision of the earliest 8088 and it will work with the 8087.

Colon Correction

In PC, Volume 1 Number 11, my column included o program segment ollowing users to switch between color ond monochrome disploys. Thot program listing seems to hove lost o few colons (:). Before each REM stotement on o line there should be o colon.

YOU CAN tell by inspecting your 8088 whether it will work with an 8087.

Although the BASIC interpreter ollows you to put o REM stotement on the same line as another stotement, it must be preceded by o colon (:) to teii the interpreter thot the REM is not part of the stotement. For exomple:

```
20 DEF SEG = &h40 : DIM A%(30) REM
setup should have been
20 DEF SEG = &h40 : DIM A%(30) :
REM setup
```

The PC Tutor will solve your procticol problems and exploin motters of generol interest. If you would like to see answers to your questions, drop o line to PC Tutor, PC Magazine, One Pork Ave, New York, NY 10016. */PC*

THE FIRST PROFESSIONAL QUALITY BAR CODE READER DESIGNED FOR THE IBM PC

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  Library Automation
  Security Identification
  Production Control
  Inventory Control
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TPS ELECTRONICS
4047 Transport St.
Palo Alto, CA 94303
415-856-6833

CIRCLE 436 ON READER SERVICE CARD

New On The Market

HARDWARE

TP-II Printer

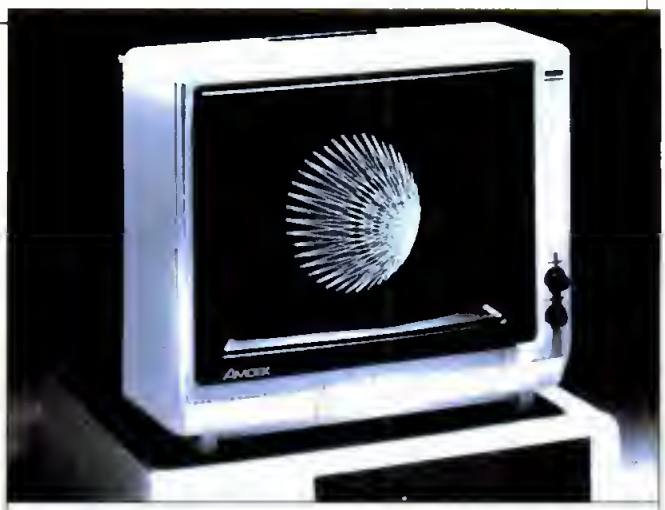
A daisywheel printer with both RS-232 serial and Centronics parallel ports. The printer incorporates a replaceable 10/12 pitch 93-character printwheel, a self test switch, and e 256 character buffer. Switches within the unit allow the user to select baud rates, parity, and character length, and ellow for polarity reversals of the unit's busy signal circuits.

Other features include the capabllity to handle X-On/X-Off and ETX/ACK; autometic underscore; and software-controllable margin and tab settings.

Avallable as option, a tractor feed attachment ellows the printer to handle continuous fen-fold forms. *(List Price: $895; troctor feed ottochment $149)*
Smith Corono
65 Locust Ave.
New Canoon, CT 06840
(203) 972-1471

CIRCLE 755 ON READER SERVICE CARD

TP-II Printer, Smith Corona



Color II Plus, Amdek Corp.

Spirit Printer

A dot matrix printer cepable of printing speeds up to 80 characters per second. The unit uses square hammers in its print head, rather than conventional rounded polnt hammers, to more fully connect horizontal and vertical lines in each 9 × 8 dot matrix forming alphanumeric characters.

The Spirit features both tractor and friction paper feeds, es well as a quick-tear cutting edge located less than one inch from the print head, ellowing forms to be torn off immedietely after printing. A Centronics parel-iel interface is standard on the unit, with a seriai interfece availeble as an option. *(List Price: $399)*
Monnesmonn Tolly Corp.
8301 S.W. Mocodom Ave.
Portlond, OR 97201
(503) 222-7080

CIRCLE 751 ON READER SERVICE CARD

Color II Plus

A color monitor designed with a switchable color weighting matrix to accurately display the 16 colors presented by the user's system. The Color II Plus uses three color sets programmed into a programmable logic arrey. The color sets provide full compatibility with color/graphics adapter cards. *(List Price: $559)*
Amdek Corp.
2201 Lively Blvd.
Elk Grove Villoge, IL 60007
(312) 364-1180

CIRCLE 747 ON READER SERVICE CARD

RAM+3

A multifunction card incorporating a clock/calendar with battery back-up, a parallel printer port, an RS-232 port, *FLASH DISK* disk drive-emulating software, and options for up to 256K of additional RAM available in 64K increments. Five memory-option versions of the RAM+3 card are available, with 0, 64K, 128K, 192K, or 256K on-board. Versions with less than 256K are provided with expansion sockets to enable users to later add RAM with 64K expansion kits. The RAM+3 is also available without memory end expension sockets.

The *FLASH DISK* emulating software is available in versions for PC-DOS 1.1 and 2.0, and provides an electronic disk drive capable of faster operating speeds than actual drives. *(List Price: No RAM without sockets $210; with sockets $320; 64K $395; 128K $470; 192K $545; 256k $620; 64K expansion kits $80)*

Seattle Computer
1114 fndustry Dr.
Seattle, WA 98188
(800) 426-8936
(206) 575-1830

CIRCLE 710 ON READER SERVICE CARD

RAM+3, Seattle Computer

CX-4800 Printer/Plotter

A four-pen cnlor printer/plotter. In printer mode, the unit can print an 80-character line at speeds up to 8 characters per second. A total of 167 characters are available, including upper and lower case letters, numbers, punctuation, graphic symbols, and special foreign characters.

As a plotter, the unit can plot lines with step-increments nf 0.1 or 0.5 mm, at speeds up to 120mm per second in a plotting area of up to 7.6 × 8 inches. Color changes can be made under software control. Printing and plotting can be mixed on a single printout.

The CX-4800 has six user controls plus self-test: four directinn cnntrols, switching pen color, and line feed. It can respond to 28 software commands. *(List Price: $695)*

Leoding Edge Products, Inc.
225 Turnpike St.
Conton, MA 02021
(800) 343-6833
(617) 828-8150
Telex: 95 1524

CIRCLE 753 ON READER SERVICE CARD

DataTalker I

A hardwere/software package providing front-end communications functions. The unit allows the user's system to emulate a range of I.B.M. mainframe batch and interactive terminals, using I.B.M. Binary Synchronous protocol through incorporated emulation software.

The DetaTalker I provides one modem port, one diagnostics port, and one link serial port, all with RS-232 interfaces. The modem and diagnostics ports are programmable for internal or external clock generation, and are byte-synchronous, bit-synchronous, or asynchronous. The link serial port is async, with internal clock generation. Internal clock speeds range from 110 to 19.2K baud. *(List Price: $995)*

Winterhalter, fnc.
3853 Research Pork Dr.
Ann Arbor, Mf 48104
(313) 662-2002

CIRCLE 744 ON READER SERVICE CARD

Submissions to "New On The Market"

Inclusion in "New on the Market" is at the exclusive discretion of the PC Editorial Staff.

PC Mogozine cannot guarantee publication of a product announcement for a particular issue. In any case, submissions of material for "New on the Market" must be received no leter than seven weeks in advance of the first week of the issue month. For example, for the Januery, 1984 issue, all material must be in our hands no later than the middle of November, approximately 2 weeks before the ad closing date.

Submissions must include retail price, distribution methods, and details of required hardware and software. Include a phone contact for both marketing and technical questions.

The details for the product announcement should be submitted in typewritten form, double-spaced on one side of the paper. Whenever possible, include 8×10 glossy photograph of the product in black & white. If applicable, include screen photographs. For best quelity, direct camera screen images are prefereble to photographs from the monitor.

All material should be sent to: **New on the Market, PC Magazine, 1 Park Ave., New York, NY 10016.**

New On The Market

DP-9725A Printer, Anodex, Inc.

DP-9725A Printer

A color dot matrix printer capable of variable print speeds and four operating modes. The unit is provided with seven ISO character sets, including ASCII, Swedish, Scandanavian, German, French, Spanish, and Italian. Other features found in the DP-9725A include left and right justification, automatic centering, positive half-line feed, in-line font changes, and internal RAM expandable to 12.5K in 4K increments.

Printing speeds range from 50 characters per second (cps) to 200 cps, depending upon operating mode chosen. Available options include OCR, superscript, subscript, and scientific/engineering fonts, bar codes, and font downloading from the user's system. *(List Price: $2,350)*

Anodex, Inc.
9825 De Soto Ave.
Chatsworth, CA 91311
(213) 998-8010
TWX: 910-494-2761

CIRCLE 617 ON READER SERVICE CARD

PIC-1 and SIC-1

Two cards that fit the short expansion slots of the user's system, providing clock/calendar functions and controlling software.

The PIC-1 card offers a parallel I/O and printer spooler software.

The SIC-1 adds an asynchronous communications port for connection to peripheral equipment with RS-232 interfaces. *(List Price: $149 each)*

Apstek Inc.
2636 Walnut Hill Ln. #335
Dallas, TX 75229
(214) 357-5288

CIRCLE 745 ON READER SERVICE CARD

Ariel RTA 331 Analyzer

A ⅓ octave real-time audio frequency spectrum analyzer that plugs into a single expansion slot within the user's system. The RTA 331 divides the audio spectrum into 31 ⅓-octave bands from 20 Hertz to 20 kHertz, and interactively displays the relative amplitudes of each frequency band. In addition to RTA functions, the unit can convert the incoming audio signal to 8-bit samples and store it within the microcomputer's main memory. With 512K RAM installed in the user's system, more than 20 seconds of audio can be stored.

The unit incorporates assembly language subroutines to handle high speed operations. All subroutines are accessed from BASIC, allowing the user to create specialized applications for the device, such as digital signal processing and speech synthesis or recognition.

Other features include an on-board pink noise generator, digitally controlled gain, ¼ dB resolution, ANSI "A," "B," or user-defined weighting, averaging, and peak hold functions. *(List Price: $649.95)*

Ariel Corp.
600 W. 116th St. #84
New York, NY 10027
(212) 662-7324

CIRCLE 756 ON READER SERVICE CARD

Instagraphic CRT Imaging Outfit

An instant photography unit that atteches to the front of 12 or 13 inch color monitors, allowing users to photograph graphic displays directly from the screen.

The imaging outfit consists of a cone designed to hold the camera unit at the proper distance from the screen. In addition, the outfit includes brackets for mounting a 35mm camera to the cone, allowing color slides to be made of images.

The complete imaging outfit consists of cone, closeup lens, two packages of Instagraphic color print film, manual, and a Wratten filter for correcting color balance of CRT phosphor in particular monitors. *(List Price: $195)*

Eastman Kodak Co.
343 State St.
Rochester, NY 14650
(716) 724-3169

CIRCLE 754 ON READER SERVICE CARD

Maverick SMD PC-80

A disk controller/formetter with an SMD interface, allowing users to attech up to two high-capacity SMD disk drives to their systems. The device is compatible with over 100 drive families from 35 manufacturers, available in capacities from 16 to 600 megabytes.

A high speed CMOS processor external to the data stream serves to regulate activity on the board. Data transfer rates of up to 20 Mb can be accommodated, four times the rate of typical Winchester drives. Transfers across the bus can be supported through high speed DMA or progremmed I/O.

Other features of the Maverick SMD PC-60 include 32-bit ECC with 11-bit error correction, variable sector interleaving, bad sector and track replacement, and overlepped seeks. *(List Price: $1,895)*

Requires: PC-DOS 2.0.
Interphase Corp.
13667 Floyd Cir.
Dallas, TX 75243
(214) 236-0971
Telex: 73 2562 (TELESERV)

CIRCLE 746 ON READER SERVICE CARD

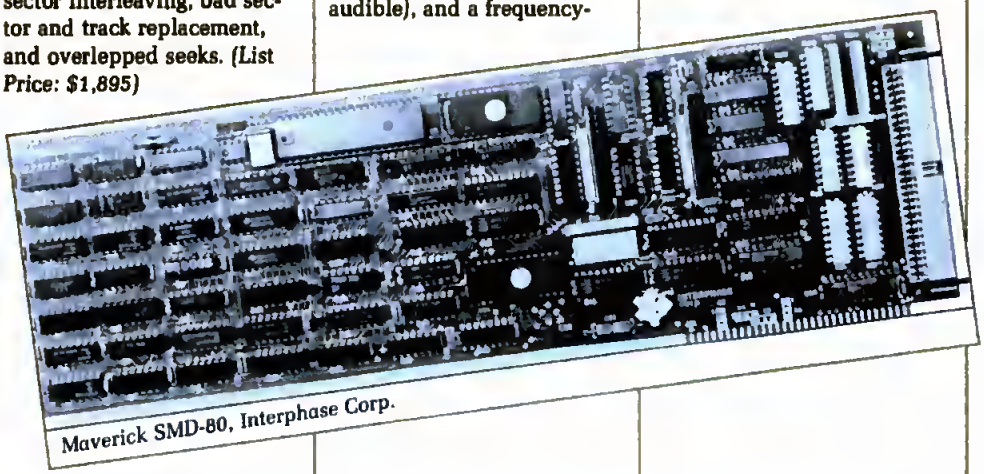
RAMLOK 250B Standby Power System

A standby power system rated et 250 watts et 115 VAC. The device includes a 10 amp-hour sealed bettery. Capabilities of the RAMLOK 250B include radio frequency interference filtering, voltege surge suppression, over and under line voltage protection, bettery charger with overcharge and short circuit protection, battery condition meter, failure indication (both visuel and audible), and a frequency-controlled square wave output, 60-cycle inverter. The inverter is contained in a separate enclosure, allowing remote placement of unit.

The RAMLOK device protects the user's system egainst power feilures and interruptions for short pariods, and line fluctuations of less then 150 or over 130 volts. Standby operation from the battery can be up to 10 minutes, and the unit automatically switches back to line power when it is restored, recharging the battery. A front panel condition meter indicates charging status. *(List Price: $545)*

Ladco Development Co., Inc.
P.O. Box 464
Olean, NY 14760
(716) 372-0168

CIRCLE 618 ON READER SERVICE CARD



Maverick SMD-80, Interphase Corp.

New On The Market

NTS10 Terminal Server

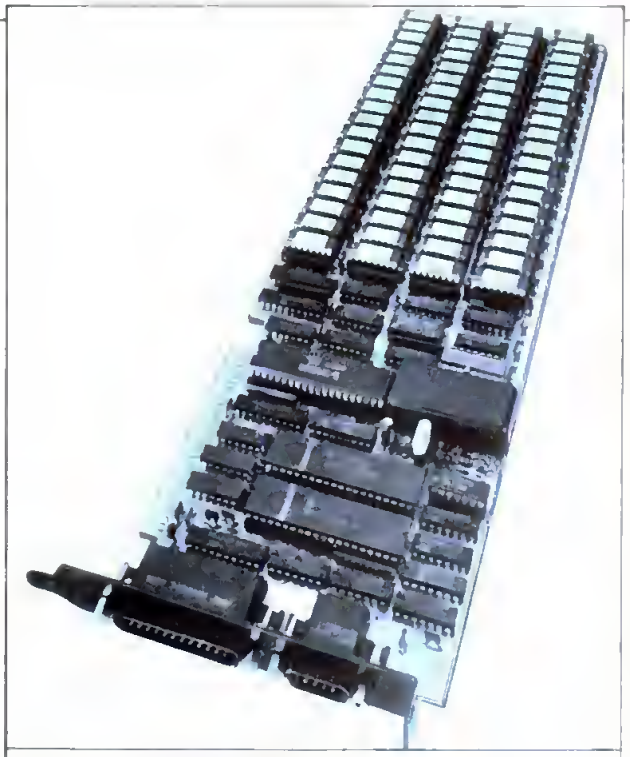
An interfece device allowing any asynchronous FS-232-C serial I/O device, including personal computers to link with Ethernet IEEE-802.3 standard local area networks. The NTS10 provides universal connections electronically, allowing PC-to-Host computer, PC-to-PC, and PC-to-Device communications, overcoming device incompatibilities. The unit can also serve to eliminate the need to hardwire a great number of RS-232-C devices. Instead of running point-to-point wires between devices, the NTS10 multiplexes all device communications onto a single coaxial cable that can run thousands of feet.

The NTS10 contains either four or eight ports, depending upon model chosen. To enable large clusters of devices to be linked together and attached to a network, up to four NTS10 units, or 32 ports, can be daisy-chained together to share a common transceiver unit connection to the Ethernet. Each device attached to an NTS10 may be assigned two different logical nemes, permitting users to access devices by referencing them with convenient terms.

For network security, the unit offers programmable passwords that protect against unauthorized connections to a networked device and unauthorized reconfigurations of an NTS10 port. *(List Price: 4-port model $2,500; 8-port model $3,200)*

Interlon, Inc.
3 Lyberty Way
Westford, MA 01886
(617) 692-3900
Telex: 95 1909

CIRCLE 535 ON READER SERVICE CARD



ADDRAM Plus, Profit Systems, Inc.

ADDRAM Plus

A multifunction board providing two asynchronous communications adapters, a clock-calendar, and 64K RAM expandable to 512K. The board includes *RAMDISK*, *RAMSPOOL*, and *TASCMASTER* software.

RAMDISK allows a user to create one or two electronic disk drives in RAM, utilizing up to 320K RAM capacity each. *RAMSPOOL* allows the user to print information while working with the computer on other applications. It can work with both serial and parallel printers, and can operate both types simultaneously.

TASCMASTER software allows the user to run up to nine different applications programs concurrently, in background mode. The user can move freely between the different programs with a few keystrokes, without terminating any of the programs. Floppy disk drives or *RAMDISK* can be used in either a global configuration—allowing access by all tasks to the drive's contents—or local configuration, allowing only one task to have access to a drive's contents. *(List Price: $475-$1,175, depending upon board's port configurations and RAM capacity installed)*

Profit Systems, Inc.
P.O. Box 1039
Berkley, MI 48072
(313) 559-0444

CIRCLE 749 ON READER SERVICE CARD

RGB Interfaces for Profeel Monitors

A 16-color RGB interface for Sony Profeel monitors that can support an 80 × 25 character text screen. The unit includes an electronic cable assembly with mating connectors for the user's system and the monitor.

The interface comes in two basic models: the RGB-1000, designed for Profeel models KX-1901 and KX-2501; and the RGB-16L, designed for use with Profeel KX-1211HG, KX-1901A, and KX-2501A. The RGB-1000 provides digital TTL signals for Red, Green, Blue, and an intensity circuit for the standard 16-color display. The RGB-16L provides 16 color Analog RGB signals and sync.

Options available for

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TOTAL RECALL - power and sophistication in list management for both the novice user (everything's in 'English') and the computer whiz (extremely flexible).

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- Design your own Mailing Labels using your own data plus an optional message line. Prints 1, 2, 3, and 4 across labels.
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- DOS 1.1 and 2.0 compatible. Uses standard DOS files. Up to 100,000 records per file using DOS 2.0.
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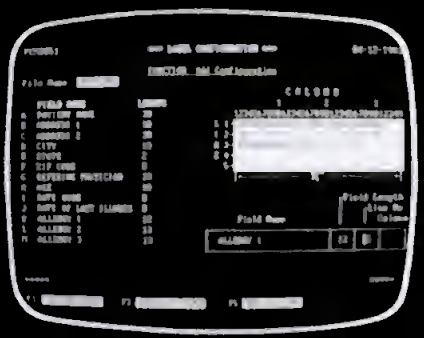
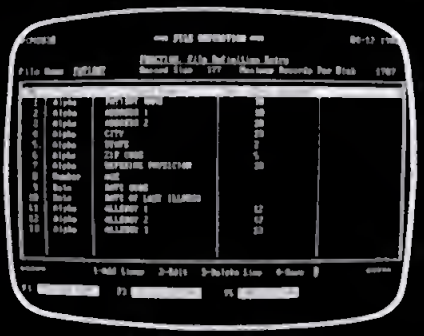
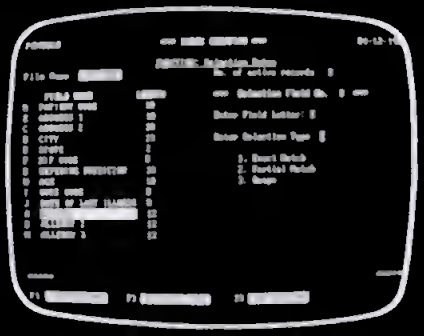


CUSTOM MAILING LABELS



FILE DEFINITION



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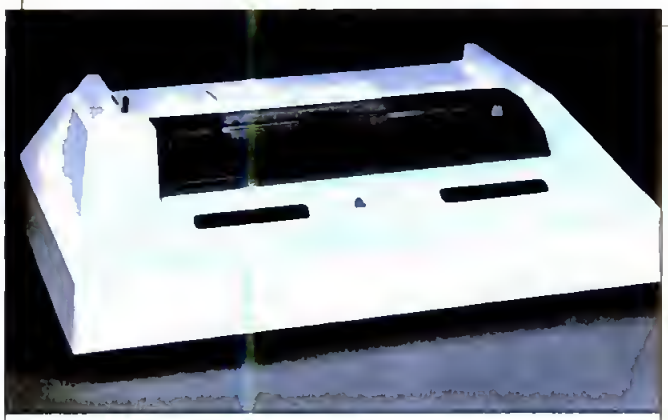
The SOFTA Group, Inc.
778 Frontage Road Suite 106
Northfield, IL 60093
312/446-SOFT

CIRCLE 360 ON READER SERVICE CARD

New On The Market



DP 6500 Rapid/Scribe, Anadex, Inc.

both models include longer cable lengths, simultaneous multiple monitor displays, and software-selectable RGB or Composite Video signals, for combination video recorder/PC applications. Also available for the RGB-16L is a non-standard 15-color display. *(List Price: RGB-1000 $99; RGB-16L $109)*

Telemax, Inc.
780 Lorraine Dr.
Box 339
Worrington, PA 18976
(215) 343-3000

CIRCLE 748 ON READER SERVICE CARD

DP 6500 Rapid/Scribe Printer

A high speed dot matrix printer capable of printing at 500 characters per second (cps) at 10 character inch (cpi), or 540 cps at 12 cpi. Line print speed when printing 80 columns is 275 lines per minute.

The printhead is an 18-needle arrangement, divided into two vertical columns of nine needles each, which allows the unit to print two overlapping series of dot patterns to achieve print speed. Other features of the DP 6500 include proportional spacing at 10, 12, 15, and 16.4 cpi, at speeds up to 415 cps. A duel-pass correspondence mode can provide proportionel specing at 10 or 12 cpi at 100-120 cps. Character sets include ASCII, Swedish, Danish-Norwegian, German, French, Spanish, and Italian. A graphics mode provides e dot resolution of either 72 or 144 dots per inch.

Options available include character font downloading from the host computer, alternate cherecter fonts in PROM, and UPC and Code 39 bar codes. Internal buffer storage capacity is 4.5K bytas, with an additional 16K evailabie as en option. *(List Price: $2,995)*

Anodex, Inc.
9825 DeSoto Ave.
Chotsworth, CA 91311
(213) 998-8010
TWX: 910-494-2761

CIRCLE 752 ON READER SERVICE CARD

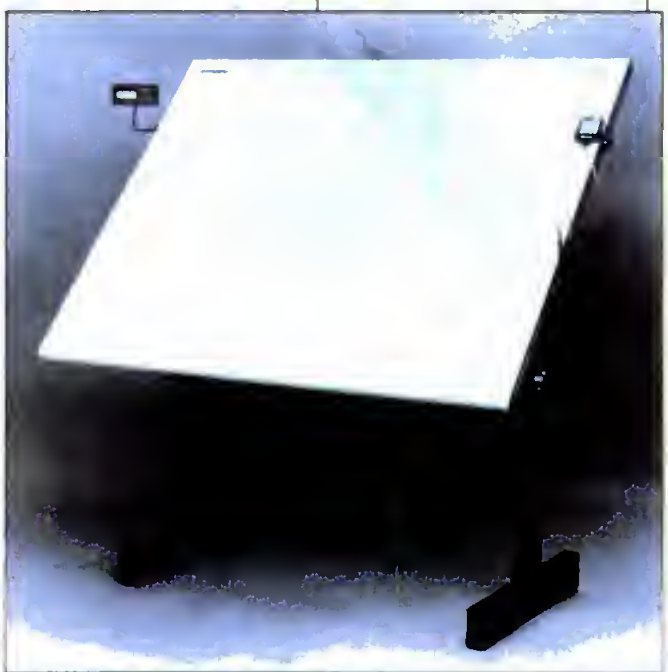
Microgrid Digitizer Series

A lina of six digitizing teblets, ranging in size from 12 × 12 inches to 42 × 60 inches. The tablets can be interchanged to satisfy differing document size requiremants. Smaii tabiets have a variable tilt mechanism, wbile larger teblets can be mounted on an adjustable stand. Tracks on tha side of these tablets allow the user to mount displays, stylus, and cursors. Holders may be placed on either side of the tablets, to accommodata left or right handed users.

The tablets offer up to 1,000 lines per inch resolution and ± .010" accuracy (±.005" accuracy is aveilebla as an option). The digitizers are linked to a user's system through a single controller/interface board, which includes dual RS-232 interfaces and a parallel interface, self-testing, and interactive diagnostics. Availeble options include a one button stylus, or 3, 4, and 16-button cursors. The stylus incorporates two user-assignable switches: a pen tip switch end barrel activation button. The switchas can be usad to changa oparation modes, and call menus onto the display. *(List Price: $1,300-$5,500)*

Summagraphics Corp.
35 Brentwood Ave. Box 781
Fairfield, CT 06430
(203) 384-1344
Telex: 96 4348

CIRCLE 750 ON READER SERVICE CARD

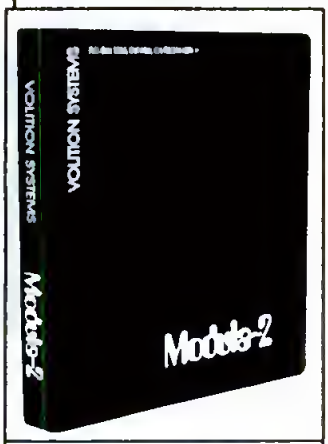


Migrogrid Digitizers, Summagraphics

SOFTWARE

Modula-2

A programming language designed as an alternative to assembly language, Pascal, C, end Ade. It is structured around a llbrary of separately compiled modules, including *InOut*, a set of routines for reading and writing basic types to standard *I/O* files; *Terminol*, providing console *I/O* and keyboard polling; *Texts*, providing routines for reading and writing to files, supporting random and sequential file access; *Storage*, routines for dynamic varieble allocation and deellocation; *Processes*, providing process scheduling and synchronization facilities; and *Program*, emong others, providing code overlays and allowing a programmer to incorporate other progrems into a new program as modules. Module-2 programs and subprograms communicete by sharing llbrary modules.



Modula-2, Volitian System

The languege peckage includes Modula-2 and Pescal compilers, en ASE editor, V-NIX commend shell (providing a UNIX+ like programming environment), and e set of utility programs for file manipulation and electronic mail communication. *(List Price: $595)*
Requires: 64K, two disk drives, p-System vers. IV.
Volition Systems
P.O. Box 1236
Del Mor, CA 92014
(819) 481-2286

CIRCLE 800 ON READER SERVICE CARD

EXBIDITE

A program to create seles contract bids or cost estimetes based upon materiels required from user's inventory. It utilizes tables of inventory items end prices to creete itemized estimetes listing items or services needed, quantities, prices, totals, as well as information identifying the compeny, customer, ennotations, terms, and type of project. Once creeted, the estimete can be printed for the customer and stored on disk for reference or later updating. The program can handle en unlimited number of inventory items, prices for eech item can be updated at any time, and the margin of profit for eech estimete cen be adjusted accordlng to individual items or across the entire estimate. *(List Price: $69.95)*
Requires: 64K, one disk drive, PC-DOS, printer.
Grout & Associotes
26324 Edgewoter Blvd. N.W.
Poulsbo, WA 98370
(415) 472-7183

CIRCLE 777 ON READER SERVICE CARD

TYPE-Righter

A typing tutorial program for beginners. The program is divided into two sections, the first of which is subdivided into nine lessons. The lessons introduce the keyboard in planned steps, starting with the left hand keys, then the right. Keys are highlighted on-screen in color grephics, including a pair of "hands" on-screen indicating which key to use.

The program can be used with either a color or monochrome monitor, and exercises in the advanced section of the program can be clocked and scored automatically. *(List Price: $19)*
Requires: 64K, one disk drive, PC-DOS.
Oakes Software
2100 Oriole Dr.
Freeport, IL 61032

CIRCLE 773 ON READER SERVICE CARD

Invoicing Application Template

A template program for use with the *VersaForm Business Form Processor/Database* software package. The template permits *VersoForm* to be used to prepare invoices, and will check data entered for accuracy, automatically extend prices from quantity and unit prices, and figure sales taxes and invoice total charges. Customer payments are automatically subtracted from invoice amounts to show current balance due. The template mey be modified by the user to use *VersoForm's* "look-up tables" and list check features.

The Invoicing Applicotion Templote's report instructions use *VersoForm's* report writer to produce a variety of accounting and analytic reports, such as sales analyses and open item accounts receivables. A starter set of invoices, correspondlng to the screen, are included with the program. *(List Price: $49.95)*
Requires: 128K, two 320K disk drives, *VersaForm*.
Applied Software Technology
170 Knowles Dr.
Los Gatos, CA 95030
(408) 370-2682

CIRCLE 726 ON READER SERVICE CARD

New On The Market

POWER PAC II

A set of programmer's utilities in BASICA, providing graphics drawing abilities and special printing utilities for both letter-quality and dot matrix printers. The software package consists of three components, *The DrawPoc Program*, *The IBM/Epson Printer Program*, and *The Letter Quality Printer Program*.

The *DrawPoc Program* allows a user to draw shapes on the screen using cursor movements or the program's built-in functions for circles, boxes, and lines. The program comes with ten predrawn screens which the user may call from BASICA or execute from DOS. The program also provides a 16-color palette, of which four colors can be displayed at one time.

The other two components are utilities for printing graphics output on either a dot matrix or letter-quality printer. These utilities can also be used to print graphic images other than those created by *DrawPoc*, using either the PrntScr key or a program dump command. *(List Price: $89.95)*

Requires: 84K, two disk drives, PC-DOS, color monitor, color/graphics adapter, printer.

Monument Computer Service
Village Data Center
P.O. Box 803
Joshua Tree, CA 92252
(819) 365-8888

CIRCLE 619 ON READER SERVICE CARD

VisiAnswer, VisiCorp.

Pascal Utilities Package

A library of Pascal callable routines featuring color graphics, screen control, and music generation. The Pascal Utilities Package provides the Pascal programmer with some of the features of IBM PC BASIC, including routines to draw dots, lines and circles (including partial circles and ellipses); to store and retrieve graphic images; to interface with lightpens and joysticks; and to manipulate text on the screen.

Also included are additional features such as a graphics cursor, multiple pattern fill, and music composing formats. The setwindow, setviewport, and clipping, from SIGGRAPH's *CORE* software, are also provided.

Routines have been implemented in assembly language. *(List Price: $119; demo disk $19)*

Requires: 128K, two disk drives, PC-DOS, color monitor, color/graphics adapter.

Software Labs
1052 Lily Ave.
Sunnyvale, CA 94086
(408) 241-9539

CIRCLE 767 ON READER SERVICE CARD

VisiAnswer

A communications program allowing the user to retrieve data stored on a mainframe system running *Answer/DB* software from Informatics General Corp. *VisiAnswer* can handle all communications requirements for accessing data from *Answer/DB*, and all data downloaded to *VisiAnswer* from the mainframe system is automatically formatted for *VisiCalc*, *VisiTrend/Plot*, and other *VisiSeries* programs.

A typical configuration for an *Answer/DB-VisiAnswer* setup consists of a single mainframe system and 50 microcomputers. *(List Price: $45,000)*

Requires: Mainframe System: *Answer/DB*; Micros: 128K, two disk drives, p-System or PC-DOS.

VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
(408) 942-6081

CIRCLE 772 ON READER SERVICE CARD

Jewelry Appraisal System

A program for jewelry appraising, capable of calculating a set stone's approximate weight by formula, from data entered by the user in response to on-screen prompts.

Appraisals may be stored for later retrieval or re-use, and written appraisal forms may be standardized. *(List Price: $500)*

Requires: 64K, one disk drive, PC-DOS, 80-column display, printer.

Soft-Roy Systems
P.O. Box 70711
Sunnyvale, CA 94086
(408) 733-1938

CIRCLE 778 ON READER SERVICE CARD

Commtrac

A graphics program for use with commodities contracts. The program provides seven technical analyses, divided into two broad sections, *Anolysis-1* and *Anolysis-2*. *Anofysis-1* can calculate simple moving averages for commodities date using two to 40 day analysis, and trends between any two trading deys can be displeyed for Open, High, Low, and Close data, which can be placed elongside other displayed cherts. An objectives/retrenchments feature allow calculation of requlred close to reach a stated objective.

Anolysis-2 allows the user to create basic cbarts and graphs using local cash prices, relative strength indices, and variable speed resistance lines.

In addition, Commtroc allows the user to communicate with commodities data collection services such as AGNET and CSI. *(List Price: $300)*

Requires: 64K, two disk drives, PC-DOS, color monitor, color/graphics edapter.

Verticaf Softwore fnc.
502 E. Wor Memoriol Dr.
Peorio, IL 61614
(309) 688-2377

CIRCLE 793 ON READER SERVICE CARD

PLAN80 Vers. 2.6

A financial plenning language with the ability to create end consolidate any number of spreadsheets and transfer any number of values between sheets. It has an interactive spreadsheet mode providing common trigonometric, mathematical, financial, and depreciation functions, including ACRS, Net Present Value, Internal Rate of Return, Amortization, and aging. It uses user-assigned nemes for rows and columns, and financial models can be creeted with any editor or word processor program.

PLAN80 allows the user to transfer and consolidate parts of dlfferent spreadsbeets to a mester spreadsheet by matching row or column names. Master sheets can be consolideted into higher level worksheets as needed.

Raport formatting capabilities Include variable decimal places, dash/zero or blank nil values, brackets for minus, under/overscoring and spacing, dollar and percentege symbols, and suppression of nil value rows. *(List Price: $295)*

Requires: 128K, two disk drives, PC-DOS.

Business Pfonning Systems, fnc.
2 N Stote St.
Dover, DE 19901
(302) 674-5500

CIRCLE 782 ON READER SERVICE CARD

ResQ, Key Software, Inc.

ResQ

A database menagement program featuring command and procedure selection routines in plain English, *60* fields per record, *80* characters per field, and rapid search and sort capabilities. The progrem is hard disk and multi-user compatible, can perform logical comparisons, offers multi-level password protection, and cen calculate totals at each of eight different levels. The built-in calculation functions can produce revised reports or projections immediately whenever a single item of data is eltered.

In addition, *ResQ* stores procedures, may be accessed by word processor programs, can join files, and can export ASCII characters. *(List Price: $395)*

Requires: 64K, two disk drives, PC-DOS.

Key Softwore, fnc.
2350 E. Devon Ave., #138
Des Pfoines, IL 60018
(312) 298-3610

CIRCLE 788 ON READER SERVICE CARD

New On The Market

Expert-Ease

A spreadsheet program incorporating artificial intelligence (AI) techniques, permitting the program to evaluate entered date egainst database or user-defined policies and render decisions. The program can also learn from its "experience" over time. Each new record of data the progrem is instructed to accept modifies its "experience," and can alter the program's evaluation of future data.

Expert-Ease presents the user with three sets of screens. In the first screen, the user defines data fields by columns in e menner similiar to other spreadsheets. The program then uses its AI capability to structure the relationships between various data elements through a complex tree of IF-THEN-ELSE stetements presented to the user on the second screen. Possible errors or incomplete logical relationships are flagged for correction or completion by the user.

In the third screen, the user may permit the program to eveluete new deta in the context of the information already on file. *(List Price:* opprox. *$1,500)*
Requires: 128K; two disk drives, USCD p-System.
Export Softwore Internotionol
4 Canongote Venture
New Street, Royal Mile
Edinburgh-EH8 8BH
(031) 558-3286
Telex: 72 8191

CIRCLE 724 ON READER SERVICE CARD

Master-Control Diet and Exercise Program

A comprehensive weight-manegement program end guidebook. The user enters the names of foods eeten, as well es any exercise performed. The program then provides a report of how well the user is meeting preestablished caloric goels. Graphic reports are also available to provide long-range feedback on weight-loss success.

The program can also help the user identify problem areas in dieting and exercise, and includes a diet scorecard and programmed instruction in exercise end nutrition. *(List Price: $49.95)*
Requires: 64K, two disk drives, PC-DOS, monochrome monitor.
Healthware
1504 Leonder Rd.
GeorgeTown, TX 78626
(512) 863-7812

CIRCLE 620 ON READER SERVICE CARD

INSTAT

A general purpose statistical analysis program. Features include complex contigency tables, histograms, means and standard devietions, regression, and comparison of means. P-values are computed automaticaily.

The program ellows the user to creete stetistical summaries end analyses and print or display the results in three forms: tables, histograms, and mean plots. *(List Price: $85)*
Requires: 64K, two disk drives, PC-DOS.
Statisticol Consulting Services
517 E. Lodge Dr.
Tempe, AZ 85283
(602) 838-7784

CIRCLE 776 ON READER SERVICE CARD

THE 1dir Directory Command System

A program replacing PC-DOS prompts with en interactive command system that eliminates the need to type commands and/or file names to the command line. Files are loaded, and programs run, by positioning 1*dir*'s Fiie and Command Cursors end pressing ENTER. Feetures of the progrem include eesy scanning of any directory, progremmed function keys, batch command fecility, sort/display by file neme or extension, and a display of the PC-DOS 2.00 tree file structure.

The program includes a tutorial on the development and use of consistent file specifications. *(List Price: $95)*
Requires: 64K, one disk drive, PC-DOS.
Bourbaki, Inc.
P.O. Box 2867
Boise, ID 83701
(208) 342-5849

CIRCLE 775 ON READER SERVICE CARD

1-2-3-EXPRESS

A combined mainframe/microcomputer software package, allowing users to share database resources. The microcomputer component is an enhanced version of the *1-2-3* spreadsheet program, integrating graphics, spreadsheet functions, and data management functions with a communications facility for accessing and logging onto mainframe systems running the *EXPRESS* component. In addition, the enhanced *1-2-3* has macro language extensions with menus for performing tasks through *EXPRESS*.

EXPRESS is a high-level DSS generator for financial, marketing, and planning support. *(List Price: $945; current owners of 1-2-3 can upgrade for $450)*
Requires: Mainframe: *EXPRESS*; Microcomputer: 128K, one disk drive, PC-DOS.
Management Decision Systems, Inc.
200 Fifth Ave.
Walthom, MA 02254
(817) 890-1100

CIRCLE 715 ON READER SERVICE CARD

MetaBASIC

A pre-compiler for BASIC programming, allowing users to develop BASIC programs in modular fashion. in addition, MetoBASIC supports programming features not normally found with BASIC programs, such as Named Global Common, Symbolic Definition, Data Declaration, and Record Data Types.

MetoBASIC also features "Program Compression," allowing the programmer to make use of descriptive remarks and speces without reaching an excessive file size or slowing program execution. The pre-compiler automatically compresses the executable program module into an optimal form by suppressing remarks and unnecessary blanks, and by reassigning abbreviated names to all program variables.

MetaBASIC is available for both interpretive and Compiled BASIC. *(List Price: $59)*

Requires: 64K, one disk drive, PC-DOS 1.1, Interpreted or Compiled BASIC.

Software 126
363 Walden St.
Concord, MA 01742
(617) 369-6400

CIRCLE 786 ON READER SERVICE CARD

Typing Strategy and Letter Man

Two tutorial programs using graphica to teach touch typing techniques. Typing Strategy uses an animated image of the keyboard and a pair of hands to teach the learner the character to be typed, the position of the key on the keyboard, and which finger to use. Should an inappropriate key be stuck, that key is colored on-screen to show its relationship to the proper key. Users may pick their own starting level of competence or allow the program's diagnostic to pick their starting level. Beginning level programs include a series of exercises to teach finger-key-character reletionships using visual and eudio prompting. Advancing through the program's levels, the user is offered additional practice options, in game or non-geme forms.

Letter Man is a computer game that teaches typing through play. The user is placed in a maze filled with words, letters, and numbers, through which the learner moves by typing characters next to the *Letter Man* figure in the direction the learner wishes to go. Chasing the *Letter Man* figure through the maze are Gobblers, whose starting speed is set by the learner in words-per-minute before the game. Portions of the maze already traversed by the *Letter Man* figure are inversed, and strategically placed dollar signs ($) allow the figure to turn around and gobble the Gobblers. *(List Price: $34.95 each program)*

Requires: 64K, one disk drive, PC-DOS 1.1.

Behavioral Engineering
230 Mt. Hermon Rd. #207
Scotts Volley, CA 95066
(406) 438-5649

CIRCLE 789 ON READER SERVICE CARD

ACCULINK

A communications program allowing users to transfer date to and from mainframe systems running under VMS, RSTS-E, RSX-11M, TOPS-20, and TOPS-10 operating systems. *ACCULINK* features CRC-16 error correcting protocol; automatic retransmission of data upon error; a menu-driven configuration; multiple help screens; and *ACCUCOMP*, a compiler designed to construct command macros for communications. The latter feature provides users with command macros for fecilitating such tasks as file transfer and dialing up commercial databases, or to control the host computer from the user's system. *List Price: $245)*

Requires: 64K, one disk drive, PC-DOS or CP/M-66, async communications card, async modem.

IE Systems, Inc.
Box 359
112 Main St.
Newmarket, NH 03657
(603) 659-5691

CIRCLE 719 ON READER SERVICE CARD

HALO

A color graphics program, providing graphics primitives (line, arc, bar, pie, etc.) written in 6086 assembly language, which can be incorporated into a user's own applications programs. *HALO* is available with interfaces for six programming languages, including BASIC (interpreted or compiled), Pascal, LATTICE C, FORTRAN, and Assembler.

The program's subroutines include plot, line, arc, box, circle, and ellipse primitives, plus single commands to create bar and pie-charts. There are pattern fill and dithering commands, allowing the user to employ a variety of textures and color-mixes. *HALO* also includes commands which can make possible animation and on-screen "slide shows" through data compression techniques. *(List Price: $150)*

Requires: 96K, one disk drive, PC-DOS or CP/M-86.

Lifeboat Associates
1651 Third Ave.
New York, NY 10028
(212) 660-0300
Telex: 64 0693
TWX: 710-561-2524

CIRCLE 791 ON READER SERVICE CARD

New On The Market

CompuChurch Programs

A series of menu-driven programs for church management and administration. Programs currently available include: *Church Gifts*, for management of member contributions; *Church Shepherd II*, for management of congregation records; *Church Ledger*, an accounting system; *Word Perfect*, for word processing; and *Merge Pockoge*, for integrating data. *(List Price: $200-$675, depending upon program and user's system)*
Requires: 128K, two disk drives, PC-DOS.
MTS inc.
796 E. John Sims Pkwy.
P.O. Box 596
Niceville, FL 32578
(904) 678-3328

CIRCLE 762 ON READER SERVICE CARD

The ABC Primer

An instructional program designed to teach children the alphabet and introduce them to computers through color graphics. Children first learn to recognize letters by seeing them printed in large type on the screen. Five operating modes provide drills of increasing complexity in letter recognition. *(List Price: $39.95)*
Requires: 64K, PC-DOS, color monitor, color/graphics card.
TechArt Associotes
P.O. Box 370
Berkeley, CA *94701*
(415) 525-0870

CIRCLE 779 ON READER SERVICE CARD

SOFTPLOT/BGL

A graphics programming tool, permitting BASiC progremmers to creete graphics applications making use of device features such as dashed and colored lines, two dimensional viewing with windows, image rotation, three dimensional perspective plotting, and automatic text justification.

The software consists of two components, *EMUPLOT* and BGL. BGL is a device-independent graphics language providing functions comparable to CORE and GKS base levels, and is written in a standard subset of BASiC. *EMUPLOT* is e general purpose plotter emulator for dot metrix printers, and allows such printers to perform plotter functions, reading standard plotter commands from a diskette file. *(List price: $200)*
Requires: 128K, one disk drive, PC-DOS, monochrome monitor, dot metrix printer.
Graphic Softwore inc.
1972 Mossochusetts Ave.
Combridge, *MA 02140*
(617) 491-2434

CIRCLE 621 ON READER SERVICE CARD

Bluebush Chess

A chess program capeble of displaying U.S. Chess Federation standard pieces in color. The progrem has seven levels of difficulty, plus a setting for postal chess. Bluebush Chess will play itself, display play lists, check moves for legality, and assist player in making the best next move. Players can choose to play black or white, set up end start from any position, and take back unwanted moves. Players can change display colors, sides, board setup, or play level, at any time during a game in progress. *(List Price: $49.95)*
Requires: 64K, one disk drive, PC-DOS, monochrome or color monitor.
Bluebush, inc.
3379 St. Mory's Pl.
Sonto Clora, *CA 95051*
(408) 243-6473

CIRCLE 760 ON READER SERVICE CARD

Bluebush Chess, Bluebesh

OKIPRINT

A graphics print program for a user's system with an Okidata printer. The program will print any screen image that has been saved on disk, or the program may be merged with existing BASiC programs to print directly from the screen. Both BASIC source code and a compiled version are provided. The compiled version can print out a full screen in 55 seconds. *(List Price: $15)*
Requires: 64K, one disk drive, PC-DOS, color display, color/grephics adepter.
The Softwore Foctory
P.O. Box 1024
Morino, *CA 93933*
(408) 372-2160

CIRCLE 796 ON READER SERVICE CARD

Index Card File Program

A program providing card file capabilities. Each "card" created by the user is formatted on-screen in 14 lines by 60 columns, in a free form not requiring data to be restricted into fields. The program's global search routine can search through each card in a file for a requested word match.

The Index Card File also allows a user to perform arithmetic calculations on any part of a card and transfer results to another part of that card; sort cards into ascending or descending order; alphabetize cards and/or group cards into more specific categories; and print any or all cards in a file with or without a list of keys. *(List Price: $49.95)*

Requires: 64K, one disk drive, PC-DOS.

United Software Associates
38A W. Oakland Ave.
Oakland, NJ 07436
(201) 337-2002

CIRCLE 790 ON READER SERVICE CARD

8086 FORTRAN Compiler

A FORTRAN compiler for programmers working under CP/M-86 or PC-DOS (MS-DOS). The compiler is ANSI 1966 standard with extensions, and includes complex numbers, character data types, free formatting, unformatted I/O, logical types, double precision variables, and implicit declaration. It supports IEEE format, and has video routines such as plot the cursor, clear the screen, change character attribute (foreground, background, cursor blink), and set cursor size. In addition, the user can add device handlers to use custom I/O devices.

Other features include compact object code and run time support, and debugging support that includes subscript checking and over 200 distinct compiler error messages and illegal instruction warnings during execution. *(List Price: $425)*

Requires: 128K, two disk drives, PC-DOS.

SuperSoft
1713 S. Neil St.
P.O. Box 1628
Champaign, IL 61820
(217) 359-2112
Telex: 27 0365

CIRCLE 795 ON READER SERVICE CARD

8086 FORTRAN Compiler, SuperSoft

COGEN 6.0

A new release of the COGEN COBOL program generator. The upgraded software offers an integrated data dictionary, permanent tailoring of generated code, full data validation, arithmetic calculations, conditional selection logic, and batch processing of multiple files.

The program generator can generate COBOL source programs through a series of interactive steps using menus and prompts. Programmers can easily create data entry screens and forms for such applications as file maintenance, inquiries, and report-writing. The integrated data dictionary feature of the new release makes available to the programmer all data fields and their definitions in a single centralized format. The syntax of all data dictionary entries is checked on-line for corrections to prevent compilation errors.

Programmers using *COGEN 6.0* can permanently alter the way the system generates code, allowing applications to be fully tailored to an installation's requirements and standards. The software accomplishes this by making the program's five skeletal source code modules open to modification. Users can add subroutines, write in comments, and change the naming conventions for field definitions.

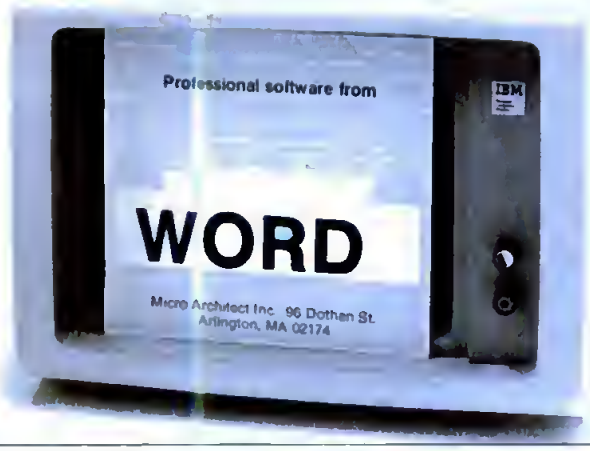
COGEN 6.0 can also handle conditional selection logic, allowing the user to specify records to be reported. Output can be directed to the screen instead of printer, enabling the program to function as an on-line query system. *(List Price: $950; UNIX Version $1,250)*

Requires: 64K, one 320K disk drive, PC-DOS, COBOL.

Bytel Corp.
1730 Solano Ave.
Berkeley, CA 94707
(415) 527-1157

CIRCLE 725 ON READER SERVICE CARD

New On The Market



Word-X, Micro Architect, Inc.

Word-X

A word processing program consisting of a full screen editor and text processor. Features of the editor include word wrap, use of function keys, true ASCII files, and the ability to make global changes.

The text formatting component of *Word-X* includes features such as file/merge, multiple text files, simplified formatting commands, plus the ability to print underlines, subscripts, superscripts, boldface, and italics. *(List Price: $58)*

Requires: 96K, one disk drive, PC-DOS.

Micro Architect, Inc.
6 Great Pines Ave.
Burlington, MA 01803
(617) 273-5658

CIRCLE 721 ON READER SERVICE CARD

Pascal Execution Tracker (PxT) and Pascal Execution Profiler (PxP)

Two utilities providing source level debugging for programs using the ($line+) metecommand of IBM Pascal. *PxT* provides e breakpoint at source line number, progrem interrupt via CONTROL-BREAK, intercept of Pascal execution errors, and save/restore of program screen imege. Displeys include saved screen image, track of recent program flow with source text and execution count for each line, list of ective procedures or functions, SS:BP-SS:SP frame for each procedure or function, and CS:IP for eech source line. Track output can be sent to e disk file for printing or analysis. *PxT* also interfaces with the PC-DOS DEBUG utility.

PxP provides an interrupt via CONTROL-BREAK, intercept of Pescal execution errors, and save/store of program screen image. The program profile can be displayed in brief formet (execution count only) or in complete formet with execution counts, histogram of execution counts, and source text. *PxP* can be used to find untested blocks. *(List Price: Both programs with manuol $175)*

Requires: 64K, one disk drive, PC-DOS 1.1 or 2.0, IBM Pascel Compiler.

AEI Softwore
P.O. Box 8018
Ann Arbor, MI 48107
(313) 973-8483

CIRCLE 780 ON READER SERVICE CARD

MasterType

A program to teach touch-typing within a game format. The program is divided into 17 lessons, eech allowing users to learn at their own pace. A "Meke Lesson" feature ellows user to program additional spelling and vocebulary gemes. *(List Price: $49.95)*

Requires: 64K, one disk drive, PC-DOS, monochrome or color monitor.

Lightning Softwore
P.O. Box 11725
Polo Alto, CA 94306
(415) 327-3280

CIRCLE 761 ON READER SERVICE CARD

The Metro Estimator/1

A program designed to assist contractors, builders, subcontractors, and developers in establishing an updetable master cost file and keeping track of construction cetegories. The program also provides cost anelysis reports for bank, client, and office use. *(List Price: $595)*

Requires: 64K, two disk drives, PC-DOS.

MetroSoft, Inc.
2222 Federol Ave.
Los Angeles, CA 90064
(213) 473-0972

CIRCLE 787 ON READER SERVICE CARD

REFORMATTER Conversion Program

A disk formet conversion program allowing users with an 8-inch add-on drive to read and write disks in I.B.M. 3740 format. Using *REFORMATTER*, data can be transferred between the user's system and larger systems by simply exchanging disks.

Versions of *REFORMATTER* are available to run under CP/M and MP/M-80, CP/M and MP/M-86, and MS-DOS. *(List Price: $350)*

Requires: 96K, one 5¼" disk drive, one 8" single-density disk drive.

MicroTech Exports
467 Homilton Ave., #2
Polo Alto, CA 94301
(415) 324-9114
TWX: 910-370-7457

CIRCLE 792 ON READER SERVICE CARD

Investment Trades Manager

A multiple portfolio management and tax accounting program. In addition to stocks, rights, warrants, options on stock, bonds, mutual funds, etc., *Investment Trades Manager* can also handle index, financial, and commodity futures, as well as options on these futures.

The multiple portfolio feature allows investment advisors, portfolio managers, and brokers to produce instant reports on each client's portfolios. Individual investors can use the feature to set up and track a variety of experimental portfolios along with actual ones.

The program's reports include current portfolio listings, portfolio evaluations, profit/loss-short/long term capital gains, tax-deductible expenses, and trading records by calendar years. The program accepts data input either directly hy the user, or from commercial database services such as Dow Jones. *(List Price: $595)*
Requires: 128K, two disk drives, PC-DOS, 132-column printer, modem.
Ellenbogen Associates, Inc.
2 Greenlea Ct.
Westport, CT 06883
(203) 226-9280

CIRCLE 718 ON READER SERVICE CARD

Program SST

A database of AISC Steel Section Tables, allowing the user to access and display properties of a single steel section or a group of sections satisfying user-defined criteria. Individual steel section properties include standard dimensions, as well as evaluation of compact section criteria, maximum elastic moment, and maximum unhraced length. Tables may be sorted hy specifying minimum and maximum values for each of the section properties. The user may add or delete sections to the Steel Section Tahie.

The program's source code is provided to allow the user to customize the program to specific needs. *(List Price: $50)*
Requires: 64K, one disk drive, PC-DOS.
Nodol Point Engineering
P.O. Box 370
Berkeley, CA 94701
(415) 525-0870

CIRCLE 622 ON READER SERVICE CARD

DATAWRITE Version 2.5

A new release of the *DATAWRITE* client write-up program for accountants. *DATAWRITE* can accept data for any number of clients, can construct files in any of 99 different styles, and can format reports as needed hy accountant or client.

Version 2.5 of the program includes streamlined operation cues, customized serialization and software protection protocol, and automatic allocation of user-defined parameters in report writing computations. The latter feature allows an item allocation to be distributed over appropriate report categories hy a fixed or variable percentage or ratio formula; this can be defined during the creation of a report format and will be computed automatically in the selected categories.

The new release also offers optional components for *Post Facto Poyroll* and *Fixed Asset/Depreciation-Amortization* processing. The *Fixed Assets* component can treat client-specific assets in standard government classes, and can compute three separate depreciation schedules simultaneously (Federal, State, and Book).

The new release of *DATAWRITE* is compatible with the IBM PC-XT. *(List Price: $3,495; Post Facto Poyroll component $795; Fixed Asset Management component $400)*
Requires: 256K, two 320K disk drives or 2Mb Hard Disk, PC-DOS 1.1 or 2.0, 80-column monitor.
Accountants Microsystems Inc.
1404 140th Pl. N.E.
Bellevue, WA 98007
(206) 643-2050

CIRCLE 763 ON READER SERVICE CARD

DATAWRITE, Accountants Microsystems

New On The Market

Hardisk Accounting Series

Five program modules for business accounting, specifically designed for use with hard disk drives. Modules include *General Ledger, Accounts Receivable, Accounts Payable, Payroll,* and *Inventory With Point of Sale.* Modules can be used alone or integrated for a complete accounting system.

The *General Ledger* component can handle up to 32,767 accounts and up to 999 profit centers: allows user-defined statement formats; and provides comprehensive audit trails. *Accounts Receivable* can show profits by customer, type, salesperson, and state; allows for open or balance forward accounting; and automatically posts data to *General Ledger. Accounts Payable* can accommodate printed and/or handwritten checks, allows flexible terms and aging periods, and can produce Cash Requirement Reports. *Payroll* allows up to five local tax deductions, up to 20 paytypes, and can print W-2 forms and checks for up to eight payroll periods. *Inventory With Point of Sale* can support five price levels, with three price breaks for quantity orders; updates *Accounts Receivable*; can calculate sales taxes; and prints sales slips or invoices. *(List Price: G/L, A/R, A/P, & Payroll $495 each; Inventory $595)*

Requires: 128K, 5 Mb Hard Disk Drive, PC-DOS 2.0.

Great Plains Software
123 N. 15th St.
Fargo, ND 58102
(701) 293-8436

CIRCLE 712 ON READER SERVICE CARD

Sup'r Access-1

A seven port RS-232 interface unit that provides electrical switching capabilities between a user's system and six other devices. The unit incorporates an internal modem that can operate at 110/300/1200 baud, with auto-answer capability and a self-test circuit. *(List Price: $695)*

M & R Enterprises, Inc.
910 George St.
Santa Clara, CA 95050
(408) 980-0160

CIRCLE 711 ON READER SERVICE CARD

Non-Profit Management System

An accounting program designed for non-profit organizations. It consists of several specialized subcomponent modules to handle payroll, billing, and accounting, and is written in COBOL. *(List Price: $250-$1,000, depending on modules)*

Requires: 126K, hard disk, PC-DOS.

Tele-Terminals
7008 Northland Dr.
Minneapolis, MN 55428
(612) 536-6050

CIRCLE 785 ON READER SERVICE CARD

Expense-Track-I

A menu-driven program to keep track of expenses for a home or small business. Though designed to maintain expense records, it can also be used to keep track of income from various sources. The program can store up to 2496 expense entries on a single-sided diskette, and can display or print expense reports. Entries are checked for errors.

While printing the reports, the user may select expenses to be listed by specifying tax status (deductible, non-deductible, or both), category, method of payment, and month. At the end of a period, expenses can be displayed or printed for all or for a particular month under all the categories, with subtotals. *(List Price: $49.95)*

Requires: 64K, one disk drive, PC-DOS, monochrome monitor, printer.

Sapano Micro Software
1305 S. Rouse
Pittsburg, KS 66762
(316) 231-5023

CIRCLE 673 ON READER SERVICE CARD

ENCORE!

A financial modeling program combining features of spreadsheets and modeling languages into a single system. *ENCORE!* provides the user with an interactive multidimensional spreadsheet, graphics generating capabilities on monochrome or color monitors, ranking capabilities, and a library of financial and statistical function routines. The software includes programming tools such as looping, branching, conditional logic functions, and a screen editor.

In addition, the program features on-line tutorial assistance for novice users, as well as a command mode for experienced users. The program allows virtual processing of models of unlimited size, error checking on data entry, compiled reports, model linking and consolidation, and the ability to create custom applications menus and user prompts. *(List price: License fee $1,850)*

Requires: 256K, two disk drives, UCSD p-System (included with software).

Ferox Microsystems, Inc.
1701 N. Ft. Myer Dr., #611
Arlington, VA 22209
(703) 841-0600

CIRCLE 623 ON READER SERVICE CARD

MICRO-TAX

An income tax preparation program that can compute and print over 30 schedules and forms for multiple clients, including corporate and partnership returns. *MICRO-TAX* can compute depreciation by individuel items or group of items, as well as hendle accelerated cost recovary, underpaymant penalties, self-employmant taxes, minimum and alternative minimum tax, and income everaging.

Forms and schedules are prepared in response to on-screen prompts for information, in a sequence similar to thet used in menuel preparetion of forms. *(List Price: Federal $1,000; Stote $250)*

Requires: 96K, two disk drives, PC-DOS.

Microcomputer Systems, Inc.
6203 Variel Ave. #A
Woodlond Hills, CA 91367
(213) 704-7800

CIRCLE 716 DN READER SERVICE CARD

AutoCom

An asynchronous communicetions program emuleting the functions of the DEC VT-100/VT-52 and ANSI terminals. The program provides terminal and modem support, Englisb configuration, unattended operetion, end multiple text and dete protocols. AutoCom incorporetes built-in support for the Hayes Smartmodem, and cen be user-adepted to support other eutodialing modams. *(List Price: $199)*

Requires: 64K, one disk drive, PC-DOS 1.1 or 2.0, asynchronous port, modem.

GKE Softwore, Inc.
236 N. Santo Cruz Ave.
Los Gotos, CA 95030
(408) 354-5010

CIRCLE 768 DN READER SERVICE CARD

DRIVEPLUS

A disk drive emulating program allowing the user to allocate up to one megabyte of RAM for use as one to four alectronic disk drives. The total system memory occupied by the emulator progrem is 32K greeter then the totel size of the emuleted drives.

DRIVEPLUS feetures includa access to full system memory; the option of specifying either drive size or size of remaining system; the option of specifying the maximum number of files for eech emuleted drive, reducing demands on complete memory by not reserving unused directory space; and the ebility to axecute programs at many times the typical speed of actual floppy disk drives. *(List Price: $59.95)*

Requires: 126K, one disk drive, PC-DOS 2.0.

Roytronics
4901 Moreno Blvd.
Bldg. 900
San Diego, CA 92117
(800) 854-4085
(619) 270-4000

CIRCLE 717 ON READER SERVICE CARD

Autocode 1, Axel Johnson Corp.

AUTOCODE 1

A program generator for the *dBASE II* date menegement system. *AUTOCODE 1* can write epplications for *dBASE II* in response to usar-dafined criteria inputted to the program using English commends. Program features include elphanumeric and numeric range checking end error trapping, calculeted fields, and the ability to generate selective field reports. *(List Price: $195)*

Requires: 64K, one disk drive, PC-DOS, *dBASE II.*

Axel Johnson Corp.
666 Howord St.
Son Francisco, CA 94105
(415) 777-3800
Telex: 33 0422

CIRCLE 727 DN READER SERVICE CARD

Power Pac I

A collection of utility programs for *BASIC* programming. The utilities include *The Formotted Lister, The DiskMod Program,* and *The BASIC Variable Cross Reference Program.*

The Formotted Lister ellows the user to define headings, page numbering, margins and line spacing for listing *BASIC* source code programs. The program also has features which can be used to generate publishable listings.

The DiskMod Program ellows users to read and inspect sectors on e disk. A full screen editor allows the

New On The Market

programmer to modify disk data in either hex or ASCII, and modified sectors can be re-written to disk. The program permits inspection of the disk directory, file allocations and the control maps for data stored on disk.

The BASIC Vorioble Cross Reference Program allows users to prepare listings on line jump references and lists of variables and their use within the program. The program can analyze up to ten programs et the same time and prepare documented listings as well as internal programming references. *(List Price: $79.95)*
Requires: 64K, one disk drive, PC-DOS, monitor, BASICA.
Monument Computer Service
Villoge Dato Cntr.
P.O. Box 603
Joshuo Tree, CA 92252
(819) 265-6668

CIRCLE 766 ON READER SERVICE CARD

Market FAX

A cllent/prospect database management and marketing support program. *Market FAX* allows a user to generate up to 450 sales and follow up letters daily, and provides for control reporting. Client/prospect contact can be scheduled on a cyclical basis, es the program's reports can keep track of when a customer should be called, a letter sent, or an appointment kept.

The program's letters can be changed to suit a user's needs, and are personalized and generated either on an individual basis or as part of an automatically sequenced campaign. *(List Price: $495)*
Requires: 98K, two disk drives, PC-DOS.
Scientific Marketing, Inc.
3303 Harbor Blvd. #G-9
Costo Mesa, CA 92628
(714) 957-0225

CIRCLE 774 ON READER SERVICE CARD

ES PAINTER

A graphics program allowing the user to create drawlngs on a displey screen using a joystick-type control. The program features simplified keystroke commands and two sets of on-screen pens, each set containing three dlfferent colors. Colors and pen types can be changed at any time during the creation of e graphics drawing.

The program includes a disk with nine pre-drawn pictures, and a User's Manual with a reference card summarizing all commands. *(List Price: $45)*
Requires: 64K, one disk drive, PC-DOS, color monitor, color/graphics adapter, joystick, and game edepter.
E & S Software Services
P.O. Box 238
Bedford, MA 01730
(617) 275-8534

CIRCLE 770 ON READER SERVICE CARD

SANDMAN MEDICAL

A program for medical practices, written in d*BASE II*, for single or multiphysician offices. The program allows users to set up and maintain patient records, charges, and payments, wlth eging, audit trails, and file re-indexing abilities.

Other features include patient-record deletion restriction to only those records with zero balence, ablllty to print out one-time statement-receipts without creating a permanent file, and 22 management reports, including daily charges and payment journal. *(List Price: $1,000)*
Requires: 64K, one disk drive, PC-DOS.
Perceptions, Inc.
17 Pine Lake Dr.
Arab, AL 35016
(205) 586-0014

CIRCLE 781 ON READER SERVICE CARD

Codebreaker

A game program in which logic is used to break a secret code. Based upon the Mastermind game concept, the program provides four skill levels, with three ways to play each level. In addltion, there are four bar graphs which show the frequency of scores on eech level. *(List price: $39.95)*
Requires: 64K, one disk drive, PC-DOS, color monitor, color/graphics adapter.
Sylvan Glen Software
P.O. Box 31053
Des Peres, MO 63131

CIRCLE 624 ON READER SERVICE CARD

MatchPoint/86

A program allowing users of PC-DOS (MS-DOS) operating systems to execute applicstions programs designed for CP/M-86. The program occupies 8K-bytes of RAM, and does not require equipment alterations or conversions.

MatchPoint/88 features "FileComingle," allowing users to call for data stored in CP/M-86 and use it while working in PC-DOS, or vice versa. This capability allows the two operating systems to run slmultaneously while appearing to the user's system as one operating format.

To lnitlate use, the user enters "MP86" before a program's name, and proceeds to work in the DOS environment. When the program is finished, the system returns to lts original operating system. *(List Price: $99)*
Requires: 64K, one disk drive, PC-DOS or CP/M-86.
American CompuSoft
23113A Plaza Pointe Dr.
Laguno Hills, CA 92653
(714) 472-8186

CIRCLE 799 ON READER SERVICE CARD

PCKEY

A collection of programs in 8088 assembly language, allowing a user's system to be configured as an intelligent workstation for a minicomputer or mainframe system. The software is divided into five volumes. The first allows full terminal emulation for a variety of systems. Volume Two provides text file transfer capabilities between the user's system and the host computer. Volume III provides system programmers with complete control of the terminal functions of the user's system, permitting the design of interactive systems and applications. Volume IV contains a number of PC-DOS function calls, and Volume V supports a variety of color graphics, sound, auxillary video, and analog input features. *(List Price: $800)*

Requires: 128K, one disk drive, PC-DOS, asynchronous communications adapter, color monitor, color/graphics card.

HiTech Software Engineering
5100 Poplar Ave.
Clark Tower #2754
Memphis, TN 38137
(901) 761-1761

CIRCLE 723 ON READER SERVICE CARD

Foreign Exchange Trading System

A financial data management program for institutions engaged in foreign currency trading activities. The program can process spot, forward, and option contracts, and produces confirmations, payment instructions, position analysis reports, and contract revaluation data based on current spot and forward rates. The *Foreign Exchange Trading System* can also generate daily and cumulative reports by specific currencies, and can calculate an effective break-even rate for each day contracts are scheduled to mature. *(List Price: $5,800)*

Requires: 64K, two 320K disk drives, PC-DOS.

Nissim Associates
2714 Pine St.
San Francisco, CA 94115
(415) 563-6170

CIRCLE 759 ON READER SERVICE CARD

SuperMail

A mail list management program providing 16 data fields, of which six can be defined by the user; unlimited list size; user-definable label printing format and content; and a word processor/form letter interface for custom form letter generation. The program allows the user to sort and create indexes based on one or two date items, providing sorted order output for label printing and retrieval. Unlimited retrieval capability allows output retrieval and printing to be selected by any one or combination of up to 15 date items.

In addition, a recent addition to *SuperMail*'s capabilities include an E-COM mail interface. *(List Price: $89.95)*

Requires: 64K, one 320K drive, PC-DOS 1.1 or 2.0, monochrome monitor, dot metrix printer.

Professional Software Associates
5353 Wayzata Blvd., #407
Minneapolis, MN 55416
(612) 541-0742

CIRCLE 625 ON READER SERVICE CARD

ADVI$OR and ANALY$T Programs

ADVI$OR is a stock portfolio management program for individual investors and professional money managers. The program is capable of handling over 800 separate portfolios, and can produce cross-reference reports, income reports, and year-end tax reports. Included in *ADVI$OR* is the ability to retrieve and update prices from the Dow Jones News/Retieval Service.

ANALY$T is a high-resolution technicel grephics program capable of displaying charts in four colors and providing for all forms of standard technical analysis graphics, including bar charts, logarithmic price plots, volume-price displays, and custom formulae. *(List Price: Eoch program $795)*

Requires: *ADVI$OR:* 64K, two disk drives, PC-DOS; *ANALY$T*: 64K, two disk drives, color monitor, color/graphics adapter.

Kate's Kamputers
P.O. Box 1675
Sousalito, CA 94965
(415) 332-9434

CIRCLE 769 ON READER SERVICE CARD

MicroTalk

A communications program allowing a user's system to exchange deta with PRIME computers and PRIMOS files. MicroTolk is made up of three components. The first is a terminal emulator that makes the user's system eppear as a PRIME compatible terminal. The second is a download function that lets a user take selected data from files for automatic entry into the microcomputer system. The third component, an upload function, transmits data to the PRIME host computer.

Security resident in the PRIME system remains in effect, including password protection of restricted deta. *(List Price: $300)*

Requires: 64K, one disk drive, PC-DOS, modem.

Software Manogement Systems
84 Inverness Circle E.
Englewood, CO 80112
(303) 741-3179

CIRCLE 765 ON READER SERVICE CARD

New On The Market

CommTalk

A communications program allowing tha user to access mainframa systams and information sarvicas. Faaturas lncluda automated phone directory with autodialing and autologon capabilitias, unattandad operation ability, data transfar with arror checking precision or standard transfar mathods, and tha ability to salectivaly capture incoming data directly to disk.

In addition, CommTolk options includa modulas for screen editing, alectronic mail, and natwork interfacing, as required by tha particular application. *(List Price: $89.95)*

Requires: 96K, one 320K driva, PC-DOS 1.1 or 2.0, monochrome monitor, serial port, modam.

Professionol Softwore Associotes
5353 Woyzato Blvd. #407
Minneopolis, MN 55416
(612) 541-0742

CIRCLE 626 DN READER SERVICE CARD

PlanFlow

A cash flow and manpowar planning program designed for use on larga capital projects by angineers, estimators, and contractors. Tha program providas on-screen spreadshaats and graphics capabilitias that allow a usar to prepare distribution modals and graphs for costs and manpower requirements on a project.

Distribution curva shapes can be defined and stored using historical data or proposed pricing schadules, and automatically updatad as new data is entered. The program also allows tha user to print distribution graphs for any itam or for tha total project as needad. *(List Price: $495)*

Requires: 64K, two disk drives, monitor, 132-column printer.

Project Control Systems
3317 S.W. Molcom Ct.
Portlond, OR 97225
(503) 292-5562

CIRCLE 784 ON READER SERVICE CARD

Client Management System Vers. 3.0

A time management, legal billing, and report genarating program for legal firms. The program, written in UCSD Pascal, allows a law firm to store client and case data, time, services, costs, and payments made. It can produce billing statements, a variaty of tima and financial analysis reports, as wall as handla lagal accounting naads such as trust, retainars, and unbilled time accounting.

Tha program is manudriven, and salf-prompting. *(List Price: $2,495)*

Requires: 256K, two disk drives, p-Systam (included), 80-column monitor, printar.

Compu-Law, Inc.
3520 Wesley St.
Culver City, CA 90230
(213) 558-3360

CIRCLE 783 ON READER SERVICE CARD

TeloFacts 1 and 2

A questionnaire/survey data gathering and analysis program. TeloFocts holds up to 100 quastions with Yas/No or True/False responses, or up to five multiple choice quastions. Answars can be recorded with a single keystroke, for latar tabulation, ranking, and analysis.

TeloFocts 1 displays the results from a singla question or an entire survey. TeloFocts 2 provides additional report, ranking, listing, and scoring options. In addition, TeloFocts 2 allows the user to poll subpopulation data from the general pool of respondants, and allows for parcentage analysis and graphs. It can work with weighted or unweighted variables, and can display or print results in a variety of formats. *(List Price: TeloFocts 1 $49.95; TeloFocts 2 $195.95)*

Requires: 64K, one disk driva, p-System (supplied with software), Pascal.

dilithium Press
11000 S.W. 11th St.
Beoverton, OR 97005
(503) 646-2713

CIRCLE 798 DN READER SERVICE CARD

TeloFacts, dilithium Press

Harvard Project Manager

A project planning and management program using graphics to assist the user in defining tasks, subprojects, and milestone points to be accomplished. The program creates a graphic "roadmap" as the user enters each component of a project on the display screen. The program can also display the project as a bar chart showing when each task begins and ends. Task durations may be specified in units ranging from minutes to years of working or elapsed time. The user also enters cost information for each task; as the project definition is refined, the program automatically recalculates costs and task duration times.

Another graphic technique employed by the *Harvard Project Manager* is the partitioning of the display screen into several windows, permitting the user to make on-screen modifications to the project roadmap, or to change task durations, and simultaneously monitor the effect of the changes on the project schedule. Also used are "pop-up" windows for temporary display of data, and two-dimensional scrolling, permitting the user to pan the display window horizontally and vertically to examine large project roadmaps or schedule images. Graphic output can be printed using conventional dot matrix printers.

The *Harvard Project Manager* does not require the use of add-on graphics adapters in the user's system, as it employs standard ASCII characters to produce images. *(List Price: $395)*
Requires: 128K, one 320K disk drive, PC-DOS, monochrome monitor.
Harvard Software, Inc.
Harvard, MA 01451
(617) 456-3400

CIRCLE 713 ON READER SERVICE CARD

Harvard Project Manager, Harvard Software

SurePrint

A printer support program permitting the user to change print characteristics of the printer directly online, from the PC-DOS operating system and from BASIC program instructions. In addition, printer set-up procedures requiring control codes can be simplified, as the program can display the codes on screen for reference use in ASCII, Hex, and BASIC formats.

SurePrint includes a batch print command for users of PC-DOS versions 1.0 and 1.1, as well as allowing users to control printouts using the PRINT command. Also included are BASIC statement files defining printer control variables, for incorporation into the user's own BASIC programs.

The program currently supports over 20 different parallel printers. *(List Price: $30 for one printer; $15 each additional printer)*
Requires: 64K, one disk drive, PC-DOS, monitor, parallel printer.
Dickinson Associates, Inc.
P.O. Box 1358
Melville, NY 11747
(516) 427-2366

CIRCLE 728 ON READER SERVICE CARD

Micro Impact

A microcomputer version of the *Impact* financial modeling language. The software permits the user to design applications programs specifically to requirements, in four major areas: Planning, Actuals, Control, and Data Consolidation. *Impact* allows analysis of financial data on monthly, quarterly, and year-to-date bases, on operational and management levels, for expense and revenue purposes, and for forecasting of volume from historical records.

A model is constructed using the software's rules and built-in financial, forecasting, and statistical functions. Once the model has been designed, an unlimited number of alternative scenarios can be studied by changing the data or rules, or by using any of the *Impact* special analysis commands. Reports can be created and implemented one at a time and later integrated into a larger application. The user may at any time change the content or format of existing reports or change the requirements of the application as needed. *(List Price: First copy $2,500; Corporate license with 25 copies $30,000)*
Requires: 196K, two disk drives PC-DOS 2.0 or CP/M-86.
MDCR Inc.
760 Hwy. 18
E. Brunswick, NJ 08816
(201) 257-5700

CIRCLE 757 ON READER SERVICE CARD

New On The Market

Farm Accounting Control System (FACS)

An accounting program for farm manegement that can meintain up to 300 accounts with nine reporting levels, and can track both peid end unpaid expenses. It incorporates e Sales Journal that keeps track of weights end units such as bushels or herd, and produces cash flow reports thet will monitor cash flow totals, provide monthly and yaarly totals, as well es monthly averages and percentages of totel income. Fiva profit end loss formats contein from one to 300 accounts; from income and expenses only to income and expense with weights, units, everage weights, average units, transection detes, end descriptions and check numbers. Trial closings can be genereted at eny time without affecting period end or year end figures, and the trial balance report verifies sales, expenses, assets and liebilities.

A check registering component of the program records checks and checking account balances, end e cash requirement forecest keeps treck of unpeid expenses and upcoming payments. In addition, the program contains a *VisiCalc* conversion that can interface profit and loss reports and ellow projection analysis. *(List Price: $525)*

Requires: 64K, two disk drives, PC-DOS, monitor.

Verticol Softwore, Inc.
502 E. Wor Memoriol Dr.
Peorio, IL 61614
(309) 688-2377

CIRCLE 794 ON READER SERVICE CARD

Pro Football Stats

A detabase and operating system that shows every professionel football geme since 1970. The program can displey every team's win/loss record, ldentify coeches, whether the game was at home or ewey, the pleying surfaces, and the teem's history egainst odd-makers' spreads.

Using *Pro Football Stots*, a user can probe how any team has performed against the spreed under whatever criterie the user wishes, using more then e decade of information. New dete can be entered manuelly by the user, or eutomatically through the program manufacturer's commercial detebase service. *(List Price: $495)*

Requires: 64K, one 320K disk drive, PC-DOS. Modem required for eutometic detebase updating service.

Eostern Computer Consulting Associotas, Inc.
11 Dick Dr.
Worcester, MA 01609
(617) 757-3131

CIRCLE 714 ON READER SERVICE CARD

Surge Suppressors, Computer-Mote

ACCESSORIES

PTI Back-Up Power Supply

A 200-wett auxiliary power supply, designed to protect the usar's equipment from altered or lost data resulting from sudden power loss or line irregularities. The unit is equipped with two A.C. outlets and internai battery. *(List Price: $329)*

Production Technology Internotionol
4740 Scotts Volley Dr.
Scotts Volley, CA 95066
(408) 438-3870
Telex: 35 7403

CIRCLE 627 ON READER SERVICE CARD

Surge Suppressors

Three models of solid-stete voltege surga suppressing devices, designed to fit into standard three-prong duplex outlats. The Mini Surge Suppressor feetures en EMI-RFI filter to eiiminate iine noise. The Maxi model faatures e steady stete heat dissipetion capebility of 25° C/40W, and has a 4½-foot power cord. The Micro modal hes the same features es the Maxi without power cord. *(List Price: Mini $97.50; Maxi $89.50; Micro $59.95)*

Computer-Mote Inc.
1006 Hampshire Ln.
Richardson, TX 75080
(800) 527-3643
(800) 442-4006, in Tex.
(214) 669-2360

CIRCLE 738 ON READER SERVICE CARD

CT100 Computer Table

A computer table finished in hickory vinyl veneer. The CT100 is 34 inches high, 33 inches wide, and 17 ¾ inches deep. It hes e full-width pletform above the work surfece thet can hold a monitor, disk drive, end printer, and a storage shelf below the desk surfece to hold manuals, software, and eccessories. *(List Price: $69.95)*

Bush Industries, Inc.
312 Foir Oak St.
Little Volley, NY 14755

CIRCLE 735 ON READER SERVICE CARD

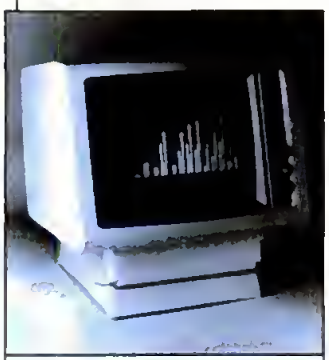
PC Pedestal II

A tilt and swivel edd-on base for the IBM PC Color Display. The device allows the displey to be positioned for maximum ease of use by a system's operator. The pedestal matches the IBM PC In style, color, and finish, and provides eir circulation via cooling slots that correspond to vents at the base of the monitor.

The PC Pedestal II can be used with the IBM Monochrome Display as well. *(List Price: $79.95)*

Curtis Manufocturing, Inc.
20 Grove St.
Peterborough, NH 03458
(603) 924-7803

CIRCLE 730 ON READER SERVICE CARD



PC Pedestol II, Curtis Manufacturing

The Personal Conditioner, Model PC 150

An AC lIne conditIoner rated at 150 watts, providing output voltage reguletion of ± 6% for line surges and sags of +10% to −20%. The PC 150 filters both common mode and transverse mode noise from the power lIne, producing a sine wave with a maximum distortion of 5%. *(List Price: $150)*

Gould Inc.
Power Conversion Div.
2727 Kurtz St.
Son Diego, CA 92110
(800) 854-2658
(619) 291-4211
TWX: 910-335-1241

CIRCLE 628 ON READER SERVICE CARD

PC Carrying Cases, Production Technology Internotionol

PC Carrying Cases

A line of fitted carrying cases constructed of plywood covered in saddle-stitched vinyl. The cases feature removebie tops, ellowing the equlpment contained to be operated without removing It from the case. Four models are presently aveilable, for individual computer components as well as for several PC printers. *(List price: Printer Cases $66; Computer Coses $99)*

Production Technology Internotionol
4740 Scotts Valley Dr.
Scotts Volley, Ca 95068
(408) 438-3870
Telex: 35 7403

CIRCLE 648 ON READER SERVICE CARD

New On The Market

Rolltop-100 Disk Storage File

A storage unit for floppy disks that will store up to 100 5¼-inch disks. Made of injection-molded plastic with non-skid rubber feet, the unit includes ten plastic dividers for separating disks into sections thet can be labelled. A locking top model is also availeble. *(List Price: $36; locking $48)*
MicroComputer Accessories, Inc.
1545 Pontius Ave.
Los Angeles, CA 90025
(213) 477-4216

CIRCLE 732 ON READER SERVICE CARD

Dust Cover Set

A disk drive and keyboard dust cover set made of smoke colored crystal styrene, designed to fit the components of a user's system. *(List Price: $19.95)*
CompuCoble Corp.
1440 S. Stote Coliege Blvd.
Anoheim, CA 92806
(800) 222-2332
(800) 821-0884 in Colif.
(714) 835-7330

CIRCLE 729 ON READER SERVICE CARD

Whisper Volume Control

A plug-in sound level control which plugs directly into e system's main board, so it does not require a slot or game port. Also aveilable is a model incorporeting a regular headphone jack. *(List Price: $22.95; with headphone jock $25.95)*
Informotion Dynomics Corp.
1251 Exchonge Dr.
Richordson, TX 75081

CIRCLE 733 ON READER SERVICE CARD

System Support Platform Drawer

An 18-gauge steel support unit upon which a user's system can be placed. The unit features a cantilever slide-out drawer to hold a full-size keyboard. *(List Price: $89)*
MicroComputer Accessories, Inc.
1545 Pontius Ave.
Los Angeles, CA 90025
(213) 477-4216

CIRCLE 731 ON READER SERVICE CARD

Computer Furniture

A line of wood crafted furniture designed for use as computer work stations. Adjustable shelf units feature two shelves and a fixed bookcase. A drawer unit, which attaches to any standard workteble in the product line, is designed specifically for disk storage and has a pencil trough.

Chairs are constructed of solid oek, walnut, or cherry, with beige or brown upholstered seat cushions. Aii furniture is available in either steined or natural finishes. *(List Price: Sheif Unit: Oak $105; Wolnut/Cherry $150; Drawer Unit: Oak $58; Wolnut/Cherry $68; Choirs: Oak $120; Walnut/Cherry $150)*
The Wood Works
11th & Hoskell, Rt. 2,
Box 407
Lawrence, KS 66044
(913) 842-7797

CIRCLE 737 ON READER SERVICE CARD

Digital Tape Cartridges

A line of four ¼-inch digitel tape cartridges for use with removeble-media start/stop and streaming tepe drives. The four cartridges include 1600 bpi, 6400 bpi, and 10,000 fci, as well as the high-cepecity 555 cartridge. The letter allows 23% more capacity than an industry-standard 450 foot cartridge, end can store up to 50 Mb of date when used with eppropriate drives. *(List Price: $27 to $47.50, depending on model)*
Dato Electronics, Inc.
10150 Sorrento Volley Rd.
Son Diego, Co 92121
(819) 452-7840
Telex: 69 7118

CIRCLE 629 ON READER SERVICE CARD

Tape Cartridges, Data Electronics Inc.

Ped-S-Tal Display Platforms

Two display mounting plotforms providing tilting, swiveling, and vertical positioning of monitors, systems units, and small printers. Designeted the P-12 dasktop and the P-14 desk clamp, both units provide space within a hollow center support pylon for power and signel cebles.

The units are constructed of machined aluminum castings encased in heavy plastic, and are tested to 150 lb. loads. *(List Price: P-12 $108; P-14 $119;* plotforms ronge between *$9-$34,* depending upon size*)*

ABC Systems, Inc.
511 11th Ave. So., #208
Minneopolis, MN 55415
(612) 333-0004

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CIRCLE 128 ON READER SERVICE CARD

EDITED BY BILL MACHRONE

PC readers help each other by passing along their tips and tales of tribulation.

User-to-User

This month's submissions cover o couple of populor areos: conquering feor of batch files, more utility for WordStar ond RAM disks, some dromotic POKES you con use in BASIC programs, ond o continuotion of the discussion on rondom numbers. Contributing Editor Steve Mones kicks off with this debunk of the perils of batch file creation.

Batch Is Beautiful

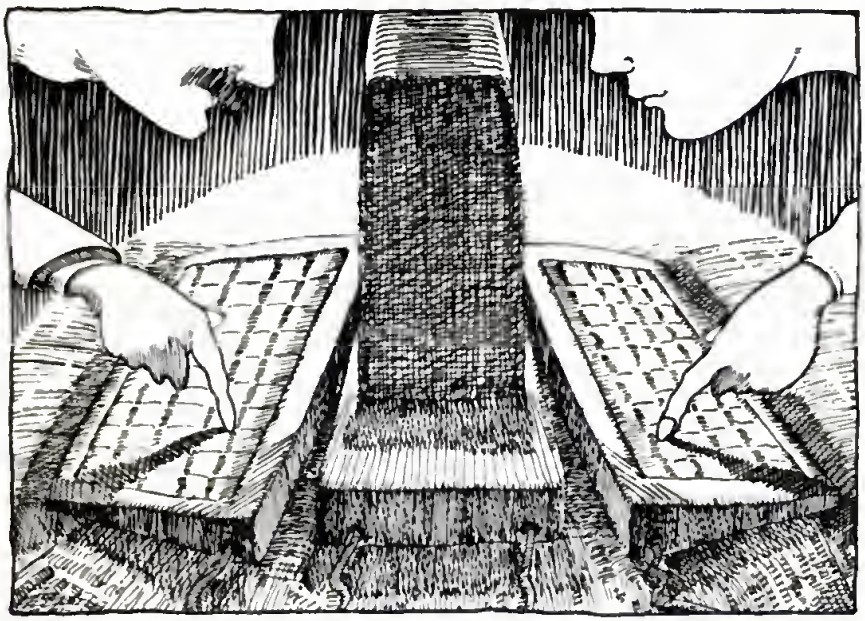
Batch files ere wonderful. They cen load your computer with a disk emuletor (by executive fiet, hereafter forever to be known as "fake disk"), do fancy copying operations, and even print cantankerous remarks on the screen when some bozo tries to do something stupid. IBM should call them "Wonderfiles," and the DOS manuals should give lots of examples of whet you can do with them.

But since IBM tells you only that DOS files can be creeted from the console or from the utterly incomprehensible EDLIN, most PC users don't even bother trying. Working from the console is en utterly thankless task. And working with EDLIN is like eating dog meet—something most people have heard ebout but, sensibly, are unwilling to try.

Listen up: Betch files are just what they sound like—files. They can be created with any word processor thet produces DOS files. (Thet includes most of the majors, but if you use something in p-System or CP/M-86, you're out of luck.) You can edit them, fool around with them, copy them—enything you cen do with any other file. This means it's easy to experiment with them.

When creeting betch files, be sure you put e carriage return at the end of each line, especielly the lest one. When you're ready to check it out, go into DOS and order it to TYPE FILENAME. BAT. If the file looks reasonable on the screen (that is, not full of funny charecters you didn't mean to put in), it's almost certain to work just fine.

Stephen Manes
Bronx, New York



Following logicolly on the heels of your newfound freedom with batch files, here's o solution thot unshockles you from lost file woes when using WordStar (or any other text editor) on o RAM disk.

The Ultimate WordStar Utility

Okay, so I lied. The ultimate WordStor utility is the one that lets you type Alt-W for "Write" and fills the disk with page upon page of prose that would make Tolstoy proud. I'm working on it.

But in the meantime, how ebout a little gem of a batch file that'll make those s . . . l . . . o . . . . . w WordStor saves e thing of the past? It's called W.BAT. It's for everyone who uses a disk emulator but has been too scared to put text files on it. (I assume, if you've got e fake disk, you've already got all the WordStar files on it, thereby avoiding those obnoxious, grinding WAITs. If you don't, shame on you.)

Okay. This file is called W.BAT end assumes you've got WordStor configured to run from drive C, and that your files will

be on that same drive. If your setup works differently, simply edit W.BAT and adapt it to your needs. Here 'tis.

```
C:
ws %1
pause
copy c: %1 b:
%0 %1
```

That's all there is to it. You invoke it by typing W FILENAME (FILENAME being the name of the file you want to work on). In the peculiar syntax of batch files, %1 becomes FILENAME. In a flash, W.BAT calls up WordStor, and throws you into FILENAME. When you're ready to save your work, forget about Ctrl-KS. Instead type Ctrl-KX. That saves your file on the fake disk and throws you out to DOS, which will tell you to "Strike a key when ready . . . "

Strike a key, and DOS copies %1 (which is actually FILENAME) from drive C to drive B. Then W.BAT invokes itself—that's what the %0 is all about—and throws you back into WordStor and the beginning of FILENAME. It all happens so fast you may not believe it.

But remember: Every time you exit WordStor, via Ctrl-KX or just by the X option from the main menu, you'll get that "Strike a key" prompt. If copying FILENAME is not what you want to do, simply hit Ctrl-Break, and answer Y to the "Terminate Batch Job?" prompt. You'll be back in DOS.

You can remove the "pause" line and have the whole thing happen without benefit of human intervention. If you do, there won't be eny wey to prevent copying of your WordStor file after exiting the program, unless your fingers are faster than pianist Rudolf Serkin's.

Since you are exiting to DOS, however briefly, you'll find that when you return to your file, WordStor will restore its start-up parameters (tab settings, margins, etc.) and fail to remember where you were in your text. If this is a problem, e little creative work with a keyboard enhancer like ProKey can solve it in a jiffy.

For long files, which WordStor takes an eternity to save or copy, W.BAT is the best thing to come along since Seymour Rublnstein was a pup. To save potential grief, use WordStor's N mode to create or edit it and thereby evoid sticking funny characters in the file.

Stephen Menes
Bronx, New York

New Role for Scroll

Ever wish you could just scroll port of the screen in your BASIC programs? Here's how. It works for other longuages, os long os you con modify the memory locotions with POKE-style instructions.

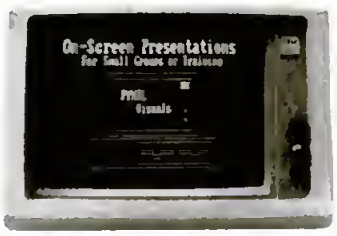
Sometimes when running BASIC programs, it is desirable to leave information on the screen without having it scroll off as new text appears on the bottom of the screen. This can be done by writing the informetion along the upper, lower, or left edges of the screen and then changing the default scroll window, so thet these areas eren't included in the scroll.

BASiC keeps track of the scroll boundaries in three locations within the default workspace segment. Memory location &H005B contains the line number of the top of the scroll window, while location &H005C contains the line number of the bottom of the scroll window. The right edge of the scroll window is stored in location &H0029.

As an example, the following lines of BASIC code will change the default scroll window to 30 columns wide, and scroll from line 18 to line 5.

```
10 DEF SEG
15 'DEFAULT WORKSPACE SEGMENT
20 POKE &H005B, 5
25 'TOP OF SCROLL WINDOW
30 POKE &H005C, 18
35 'BOTTOM OF SCROLL WINDOW
40 POKE &H0029, 30
45 'RIGHT EDGE OF SCROLL WINDOW
```

FEW THINGS ARE more frustrating than duplicating sizable blocks of code, with only minor changes.



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CIRCLE 380 ON READER SERVICE CARD

Everything on lines 1-4 end 19-25 will remein on the screen. In eddition, everything to the right of column 30 on lines 5-18 will elso remain.

Daniel Smith
Golden, Coloredo

Scroll Role Redux

Now thot you can limit your scrolling to just port of the screen, why stop there? Jeff McDonough's program creotes o mochine-lonquoge subroutine thot permits scrolling windows and bidirectional scrolling.

Just about everyone is femilier with bow Basic Print stetements can cause the screen to "scroll up" when the screen is full. This is, of course, e remnent of the days when a teletype was used as the input/output device (it "scrolls" by its very nature). However, the PC hes some interesting capebilities in the scrolling department, which can be eccessed through a mechine language subroutine.

The basic I/O system (BIOS) conteined in ROM includes routines for scrolling both up ond down. In eddition, these routines ellow e "window" to be defined, within which the scrolling occurs. This allows any rectangular area of the screen to be scrolled. One more function allows the entire window to be blanked.

The program listing (see Figure 1) will create a "BLOAD"eble mechine-lenguege subroutine, and demonstrate its use. The original routine wes developed with the Macro Assembler after careful reeding of the Technical Reference Monual.

I hope this routine will help others improve their screen-hendling techniques. Of course, since the routine is written in machine language and invokes the BIOS directly, its execution is very fest. (The demo progrem uses a dummy loop to slow it down for visuel effect.)

Jeff McDonough
West Monroe, Louisiana

Just One, Thank You

We oll know thot INKEY$ is the superior woy to get just one chorocter from the keyboard. But how do you handle the user who presses ond holds o key? This technique ensures thot you get just one chorocter.

The repeeting key feature of the IBM keyboard is usually e boon, but sometimes it can be e bene. Recently I wrote e program that posed a series of yes/no questions to the operator. I discovered thet some operators tend not to touch-type answers to such questions but to hold down e key and peer et the screen watching what heppens next. This was disastrous inesmuch es the progrem received its input through the use of the INKEY$ varieble: The answer to one question would "bleed through" as the answer to the next question. I needed e way to elert the operators to remove their fingers from the keys, and a way to suspend operation until the keyboard buffer wes cleered. Simply emptying the keyboard buffer is not adequate, because the operator is

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CIRCLE 420 ON READER SERVICE CARD

Figure 1: A machine language subroutine by Jeff McDonough that permits scrolling windows and bidirectional scrolling.

```
DEMO.BAS, listed 01-29-83

  1 CLEAR ,10000
  5 DEFINT A-Z
 10 FOR I=1 TO 6
 20 FOR J=1 TO 10
 30 READ X
 40 TOT=TOT+X
 50 NEXT
 60 READ Y
 70 IF TOT=Y THEN TOT=0:GOTO 80
 72 BEEP:PRINT "ERROR IN DATA STATEMENT #"11000+10*(I-1):STOP
 80 NEXT
 90 RESTORE
100 DEF SEG=10000/16
110 LOCAT=0
120 FOR I=1 TO 6
130 FOR J=1 TO 10
140 READ X:POKE LOCAT,X:LOCAT=LOCAT+1
150 NEXT
160 READ X
170 NEXT
180 BSAVE "SCROLL.BIN",0,60
190 CLS:PRINT "Subroutine file SCROLL.BIN created":PRINT
200 PRINT "Hit ENTER for demo."
210 K$=INKEY$:IF K$<>CHR$(13) THEN 210
220 CLS
222 DEF SEG=10000/16
224 BLOAD"SCROLL.BIN",0
230 FOR I=1 TO 10
240 FOR J=1 TO 16:PRINT "DEMO ";:NEXT
250 NEXT
260 OFFSET=0:A=7:B=1:C=0:D=19:E=22:F=59:G=32
270 FOR I=1 TO 11
280 CALL OFFSET (A,B,C,D,E,F,G)
290 FOR J=1 TO 500:NEXT
300 NEXT
310 IF A=7 THEN A=6:GOTO 270
315 FOR J=1 TO 500:NEXT
320 B=0:C=0:D=19:E=4:F=59:CALL OFFSET (A,B,C,D,E,F,G)
325 FOR J=1 TO 500:NEXT
330 B=0:C=5:D=19:E=9:F=59:CALL OFFSET (A,B,C,D,E,F,G)
340 FOR I=1 TO 5
345 B=0:C=5-I:D=10-(2*I):E=4+I:F=B+(2*I):CALL OFFSET (A,B,C,D,E,F,G)
350 B=0:C=5-I:D=70-(2*I):E=4+I:F=68+(2*I):CALL OFFSET (A,B,C,D,E,F,G)
355 FOR J=1 TO 1000:NEXT
360 NEXT
370 END

500 REM  Note: Parameter requirements for SCROLL.BIN subroutine
510 REM
520 REM     (all must be integer - explicitly or via DEFINT stmt.)
530 REM
540 REM     OFFSET = offset (from last DEF SEG) to beginning of routine
550 REM                (wherever routine was loaded)
560 REM     A      = "6" = "scroll up"
570 REM              = "7" = "scroll down"
580 REM     B      = number of lines to scroll
590 REM     C,D    = row and column of upper left corner of "scroll window"
600 REM     E,F    =  "   "    "    "  lower right corner of    "     "
610 REM     G      = attribute to be used on "blanked" lines
620 REM
630 REM  NOTES:
640 REM     (1)   (C,D) and (E,F) are relative to (0,0)
680 REM     (2)  None of the parameters is value checked by the subroutine,
690 REM            so results of invalid parameters are unpredictable.
700 REM     (3)  If B=0 then the entire "window" is "blanked".
1000 DATA  85,139,236,139,118,10,139,28,138,227,1267
1010 DATA  139,118,16,139,28,138,195,139,118,14,1044
1020 DATA  139,28,138,235,139,118,12,139,28,138,1114
1030 DATA  203,139,118,10,139,28,138,243,139,118,1275
1040 DATA  8,139,28,138,211,139,118,6,139,28,954
1050 DATA  138,251,179,0,205,16,93,202,14,0,1098
```

holding down a key, so the buffer will just fill up again. The subroutine TESTKEY does the trick. It is, however, extremely sensitive to timing. The final value of the counter KILLTIME in stetement 4030 (see Figure 2) must be determined experimentelly. Even very slight variations in coding (e.g., spaces, lengths of variable names, etc.) will change the required value. The short progrem, lines 100-240, allows one to tailor the subroutine. After that, lines 100-240 can be discarded. These lines also show how the subroutine TESTKEY should be called: by issuing e GOSUB 4010 before eech and every request for keyboard date. Optimelly, TESTKEY should be used before INPUT statements as well as INKEY$ ones.

Normen Swartz
Burneby, British Columbie

On the Verge? Try Mergel

Few things are more frustrating than duplicoting sizoble blocks of code, with only minor chonges. While o text editor is o notural for such octivities, it meons time-consuming ASCII soves, looding the editor, relooding BASIC, not to mention renumbering. Try this handy olternotive.

Sometimes a program requires writing severel blocks of code that differ only in minor ways; routines that control the movement of the cursor provide one example. Having typed in one of these routines, it is convenient to be able to copy it to e new place in the program, and then make the minor changes. Working in BASIC, I have found the following technique particularly useful.

RANDOM numbers are used extensively in computing for games, simulations, and Monte Carlo analysis techniques.

Suppose you have a program with lines 10-500, and that you wish to recopy program segment 200-300 to e locetion beginning at 510. The first step is to save the current program in ASCII formet: SAVE"PROG",A. Second, isolete the segment to be copied with two delete commands: DELETE 10-190, DELETE 310-500. Third, renumber the program segment for its new location: RENUM 510. This is the key step; you end up with all

Figure 2: The subroutine TESTKEY and a program to test it.

```
100 '  PROGRAM TO TEST THE SUBROUTINE 'TESTKEY'
110 KEY OFF
120 CLS
130 PRINT "Hold down the 'Y'-key.  If the alarm does not"
140 PRINT "sound, then increase the final value of the"
150 PRINT "counter in statement 4030"
160 GOSUB 4010   'Call 'Testkey'
170 PRINT "xxxxxxx (question no.1) xxxxxx"
180 ANSWER1$ = INKEY$: IF ANSWER1$ = "" GOTO 180
190 ' intermediate calculations, etc.
200 GOSUB 4010   'Call 'Testkey'
210 PRINT "xxxxxxx (question no.2) xxxxxx"
220 ANSWER2$ = INKEY$: IF ANSWER2$ = "" GOTO 220
230 ' intermediate calculations, etc.
240 END
4000 '
4005 '    *** Subroutine 'TESTKEY' ***
4006 '    Clear the keyboard buffer and check to see that
4007 '    no key is depressed
4010 DEF SEG=0: POKE 1050, PEEK(1052)  'See IBM Basic Manual, p. I-7
4020 '    Delay testing INKEY$, to see whether operator is holding down a key
4030 FOR KILLTIME = 1 TO 55: WASTETIME = SQR(KILLTIME): NEXT
4040 TEST$ = INKEY$
4050 IF TEST$ = "" THEN RETURN ELSE BEEP: GOTO 4010
```

GOTO's in the program segment properly numbered. Finally, merge the originel program with this new segment: MERGE "PROG." You can now move to line 510 and make any changes that are needed.

The same technique can be used to insert e program segment from enother program or from a library into the progrem that is being worked on. The segment to be merged must be renumbered to its new location and saved in ASCII format, and room must be made for it in the host program. This can eiso be done by renumbering. In the example used above, to inset a segment between 390 and 400, first make room with a command such as RENUM 5000, 400, end then use the MERGE command.

Harold Brown
DeKalb, Illinois

Random Fandom

Computerfolk seemingly never tire of discussing better woys to generote random numbers. Here ore two more points of view on the subject.

In the July column (see "User-to-User," PC, Volume 2 Number 2), Paul Burck offered a technique for generating unrepeatable random number sequences. It seems to me that the usefulness of such sequences is limited to game playing.

Surely some users will be interested in generating random numbers for sciantific studies, simulations, or statistical applications. These people will want to have saquences thet pass tests for "randomness," yet ere reproducible. It is important thet scientists be eble to verify one another's work. For this reason, the scientist must either publish the list of random numbers used, cite them from another publication available to the reviewer, or give the algorithm from which they are generated, so that the reader may reproduce the identical sequence. Burck's offering meets his particular need, but it doesn't supply enough information for others to reproduce or verify it.

Does anyone know tha algorithm that tha IBM PC uses for RND in BASIC? I am ecquainted with one user who believes that, not only is this elgorithm unpublished, but that it even varies from machine to machine!

I have included a listing of a random number generator that meets the needs I have discussad (see Figure 3). It was designed with 32-bit word mainframe computers in mind, but is also portable among many different computers. (The documentation cited in the listing was first programmed in FORTRAN.) It is a multiplicative congruential generator, handling its own extended precision arithmetic to avoid overflow errors. To run correctly on the IBM PC, I have made most of the variables double precision, and I used the FIX function to echieve the usual results of integer division. I'm certain that the period length of this generator is much greater than that of RND, as well.

Wayne Cornelius
Raleigh, North Carolina

Random numbers are usad extensively in computing for gamas, simulations, and Monte Carlo analysis techniques. I have recently developed a random number generator for the IBM PC written in C (C86 from Computer Innovations, Lincroft, New Jersey), which may be of interest to other C programmers. It is e self-seeding function, which performs as follows.

A long sequence of random numbers between 0 and 1 can be expected to have an arithmetic mean of 0.5 and e standard deviation of 0.2887. Repeated 10,000 iteration tests heve consistently yielded results within 0.01 of these theoretical values.

Repeated 1,000 iteration tests for du-

plication using integer truncation have shown a duplication rate of 5 to 8 percent at 4 decimal places, 2 to 3 percent at 5 decimal places, and 1 to 3 percent at 6 decimal places.

A one-line program which calls the function 1,000 times and assigns the value to a floating-point variable executes in 9.2 seconds. The timing may be of concern in real-time programs.

The function, shown in Figure 4, is straightforward. It maintains two static integers, the seed and a counter which is initialized to zero and incremented on each function call. The first time it is

Figure 3: A rondom number generator by Woyne Cornelius.

```
10 'IBM PC BASIC implementation of L. Schrage portable uniform random number gen
erator
20 'ACM Trans on Mathematical Software 5:132-138, 1979
30 '
40 '
50 'initialize
70 READ A#,B15#,B16#,P#,IX#
80 DATA 16807,32768,65536,2147483657,0
100 'on the 1st call only, replace ix with seed value
110 IF IX# = 0 THEN IX# = SEED#
120 'get 15 hi order bits of ix
130 XHI# = FIX(IX# / B16#)
150 'get 16 lo bits of ix, and form low product
160 XALO# = (IX# - XHI# * B16#) * A#
170 'get 15 hi order bits of low product
180 LEFTLO# = FIX(XALO# / B16#)
200 'form 31 highest bits of full product
210 FHI# = XHI# * A# + LEFTLO#
220 'get overflow past 31st bit of full product
230 K# = FIX(FHI# / B15#)
250 'assemble pieces and pre-subtract p
260 IX# = (((XALO# - LEFTLO# * B16#) - P#) + (FHI# - K# * B15#) * B16#) + K#
270 'add p back in if necessary
280 IF IX# < 0 THEN IX# = IX# + P#
290 'scale to [0,1]
300 URND! = IX# * 4.656612875D-10
310 RETURN

1 'test program for urnd algorithm
2 'load this code, then merge"b:urnd
83 GOTO 1000
1000 SEED# = 1
1010 TIME$ = "0:00:00"
1020 FOR I% = 1 TO 1000
1030   GOSUB 100
1040   NEXT
1050 FIN$ = TIME$
1070 LPRINT "Portability check for urnd routine: ( ";I%;" iterations in ";FIN$
1080 LPRINT "If ix(0) = 1 then ix(1000) = 522329230.  The observed result was"
1090 LPRINT "    ix( ";1%;") = ";IX#
1100 END


1    'listing of random numbers
1034 UR% = FIX(URND * 1.E+5)
1035 LPRINT USING "##### "; UR%;
1020 FOR I% = 1 TO 10
1023 FOR K% = 1 TO 5
1025 FOR J% = 1 TO 10
1040 NEXT J%
1042 LPRINT
1044 NEXT K%
1045 LPRINT : 'blank line every 5th line
1047 NEXT I%
```

called (and the 65,536th time thereafter), it obtains a seed from the low word of the system timer (a source of pseudorandom numbers itself). It does this through the C library function "sysint," a system interrupt function, which provides the C programmer with access to the ROM BIOS routines from within C. On subsequent calls, it adds the call count to the existing seed, a step which ensures that, if the seed ever became zero, the function would not lock at zero output. While this step (and the count variable) can be eliminated by initializing the seed to zero and testing for a zero seed to initiate the interrupt, the statistics for that function are not as good as they are for this one.

The function next generates a double precision product of the seed and pi, which it splits into its integral and fractional parts using another C library function, modf. The double precision integral part is cast into an integer representation with an acceptable (for this application) loss of digits if it is too large to fit, for use as the next seed. The fractional part is returned as the random number. The sign check before returning is necessary as the library version 1.33 modf function returns a signed decimal value. It shouldn't according to the documentation, and I have reported this fact to Computer Innovations.

William DeGrandpre
York, Maine

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Note: In the interest of accuracy, we will gladly accept—even encourage—submissions containing program listings on disk. PC will return or replace a disk, at your request. If you send us a disk, please include a printout of your submission to ensure against damage in transit.

Furthermore, all programs that create .COM or BSAVE'd executable code from decimal or hex data must be accompanied by the source code in assembly language. This, too, will reduce errors and will be intructive to all readers of User-to-User.

/PC

Figure 4: *A random number generator in C longuoge by William DeGrandpre.*

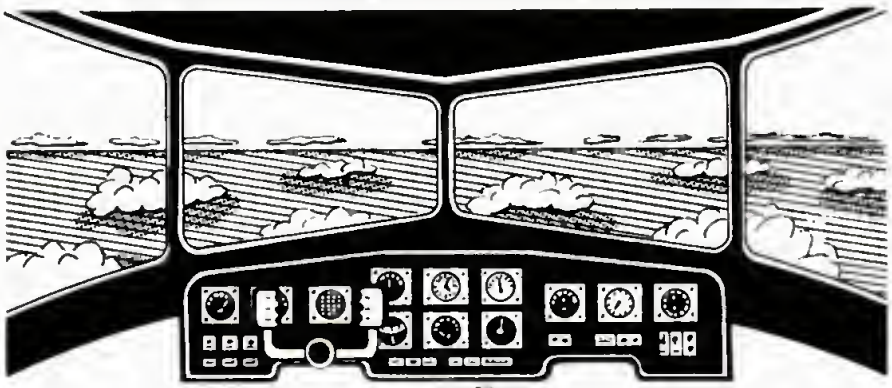
```
#define PI 3.14159265358977
struct regval {int ax, bx, cx, dx, si, di, ds, es;};

double rnd()                          /* random number generator 1 */
{
static unsigned int seed, count=0;
double ranum, nextseed;
double modf();                        /* splits int & fract parts */

if ( count==0 )  {                    /* get seed from system timer */
        struct regval srv;
        srv.ax=0;
        sysint(0x1A, &srv, &srv);
        seed=srv.dx; }                /* here it is */
else seed+=count;

ranum=seed*PI;
ranum=modf(ranum, &nextseed);
seed=(int)nextseed;
++count;
if (ranum>=0.0) return ranum; else return -ranum;
}                                     /* end random function */

A>
```

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Part I of a two-part, 10-compiler review. In this issue, the first five: Lattice C, Microsoft C, C86 from Computer Innovations, and more.

Inside Microsoft BASIC
How one BASIC-to-8088 translator works, plus predictions ebout the next release of Microsoft BASIC.

Etherseries
An in-depth look at 3Com's Ethernet-based LAN. Our writer lays out the parts of the network and explains how each functions.

Interrupts and the IBM PC
The first part of this two part article describes the PC's interrupt system, filling in a gap in IBM's documentation. The 8295A is revealed.

Graphic Reviews
The pros and cons of four color boards, including Universal Research MultiDisplay Adaptor, Amdek Multiple Adapter Interface, and Tecmar PC-Mete, plus reviews of two monochrome boards.

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If you weren't searching for it, chances are you wouldn't notice IBM's rather undistinguished-looking complex in Boca Raton. What you couldn't fail to notice, however, is that something was afoot in the "mouth of the rat." PC shares its impressions of the IBM PC's home town and the giant effects of Big Blue's first micro on life there.

Battle of Marketing

Yes folks, there are other computers out there battling with the IBM PC. PC Magazine takes a look at some serious contenders. Where did they come from? What are their prospects? How do they rate? And . . . guess which micro is projected as number 1 for 1984?

Mainframes to Micros to Mainframes

For many users the PC is becoming the terminal at the end of the line to their mainframes. For others, the mainframe is becoming the storage device wired into the PC, which all goes to prove that you can go home again.

The WordStar Industry

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